(DEEMED TO BE UNIVERSITY)

CATEGORY 1 UNIVERSITY BY MHRD, Govt. of India

KL ACCREDITED BY NAAC WITH A++ GRADE

nirf 2024 NATIONAL INSTITUTIONAL RANKING FRAMEWORK RANKED 22 AMONG ALL UNIVERSITIES

44 YEARS OF EDUCATIONAL LEADERSHIP

BACHELOR OF ARTS

ECONOMICS & PUBLIC POLICY

PROGRAM HANDBOOK 2024

For Students Admitted in Academic Year 2024-25

VISION

To be a globally renowned university.

MISSION

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.


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AWARDS

Koneru Satyanarayana,

Chancellor

Sri Koneru Satyanarayana, BE, FIE, FIETE, MIEEE graduated in Electronics and Communication Engineering in the year 1977. Along with Sri Koneru Lakshmaiah, he is the co-founder of the Institute which was established in the year 1980. He is an educationist of eminence and also an industrialist of great repute. He runs a number of industries in and around Vijayawada.

Dr. K S Jagannatha Rao

Pro Chancellor

Prof. K. S. Jagannatha Rao was one of the leading scientists in neuroscience research in globe. He was the Director on Institute for Scientific Research and Technological Advances (INDICASAT AIP), Republic Panama and contributed lot in building innovation in higher education and research in Panama since 2010. He played a key role in building PRISM (Panamanian Research Institutes of Science and Medicine) in Latin America. Dr. Rao has his research area on Brain Research and established Alzheimer's Centre and published 165 papers in leading Biochemistry and Neuroscience Journals, supervised 19 Ph.D students. He is also adjunct faculty of Biomedical Informatics of UTHS, Houston, and Advisory Board Member of UT- El Paso Minority Health NIH program, USA and Adjunct Faculty, Methodist Research Institute, Houston, USA. He was elected Member of Panamanian Association for the Advancement of Science (APANAC) - Considered as National Science Academy of Panama. He received his undergraduate and Ph.D degrees from Sri Venkateswara University, Tirupati. Later, joined in Central Food Technological Research Institute, Mysore. He received Sir C. V. Raman Award by Karnataka State Council of Science and Technology, 2003.

Prof. G P S Varma

Vice Chancellor

Prof. G P S Varma, Vice-Chancellor, KLEF, is one of the most widely experienced leaders in Indian higher education, known for his commitment to expanding student opportunity, catalyzing academic innovation, and encouraging university's civic engagement and service to society. He adorned the position of Chairman, ISTE (Indian Society for Technical Education)- AP State, TSEMCET Test Committee Member-2021 nominated By Telangana State Govt, APEAMCET Admission Committee Member in 2016 by Andhra Pradesh State Council of Higher Education, Govt. of Andhra Pradesh. He has been a very farsighted Peer Team Visit Member for National Assessment and Accreditation Council (NAAC), Expert Committee Member for University Grants Commission (UGC) Autonomous Visits. He has been an Advisory Council Member for (CEGR) Centre for Education Growth, and Research India International Centre, New Delhi, and Board Member for Big-Data Analytics Forum.

Dr. K Rajasekhara Rao

Pro-Vice Chancellor

Dr. Kurra Rajasekhara Rao, Pro-Vice Chancellor is a professor of Computer Science and Engineering (C.S.E.) having more than 35 years of teaching and research as well as administrative experience. His current research interests include topics related to Embedded Systems, Software Engineering, Software Testing, Data Sciences, Image Processing and Knowledge Management. He has authored a book and has more than 240 research publications in various International/National Journals and Conferences. Dr. KRR is a recognized as 'Research Guide' in many reputed universities and 32 doctorates were awarded under his guidance till now.

Prior to this, he discharged duties in various organizations, as a Director, Usha Rama College of Engineering & Technology (Autonomous), Telaprolu, A.P, Director, Sri Prakash College of Engineering (SPCE), Tuni and as a faculty member in various positions in KLCE/K.L.University, Andhra Pradesh for over 20 years. He contributed as a Member in Board of Studies for CSE & IT, at various prestigious institutions like Acharya Nagarjuna University, Krishna University, Sree Vidyaniketan Engineering College, Tirupathi and Bapatla Engineering College, Bapatla. He extended his services to K.L. University as Member in Board of Management, Dean's Council, Academic Council, Standing Committee, Research Board & Board of Studies [CSE].

Dr. KRR' s outstanding contributions have been honoured by various organizations. He received the "Patron Award" from Computer Society of India (CSI), India's prestigious professional society in the years 2011 (Ahemadabad) and 2020 (Bhuvaneswar). Recognising his administrative capabilities, Association of Scientists, Developers and Faculties (ASDF) through Puducherry CM honoured him with the "Best Dean" award in the year 2012. He was felicitated with the "Aacharya Ratna" from Indian Servers, IMPACT and Lions Club in the year 2019. Received "Bhishmacharya" Award in 2022 by Bharath Educational Excellence Awards. He got honoured as "Global Faculty" by AKS Education awards in 2023 and "Lifetime Achievement Award" by AIMER Society for the year 2024.

Dr. N Venkatram

Pro-Vice Chancellor

Dr. Venkatram Nidumolu, Pro-Vice Chancellor is High performing, strategic thinking professional with more than 15years of administration experience and 20 years of teaching experience in KLEFand 30 years overall experience in the higher education sector. He graduated in B.Tech (ECE) from Acharya Nagarjuna University, pursued M.S degree from BITS, PILANI in software Systems. He received Ph.D award from Acharya Nagarjuna University. He held the positions like HOD, Joint Register, Principal, and Dean-Academics before becoming Pro-Vice Chancellor. He was core member of all NBA, NAAC, & other accreditations since 2004 and he has good experience in handling of quality issues and assessment related practices.

Dr. A V S Prasad

Pro-Vice Chancellor

Dr. A. V. S. Prasad, M.E and Ph.D from JNTU, Hyderabad is a professor in Civil Engineering. He has a rich experience of 33 years in academics which includes 26 years in administration at various cadres ranging from Head of Department, Dean, Principal, Director and Pro-Vice Chancellor. He has served as Director of Audisankara group of institutions and Narayana Group of Institutions for 18 years and was instrumental in getting these institutions accredited by NAAC, NBA, Autonomous and gained many laurels from the State Government, JNTU etc. He has served as Pro-Vice Chancellor of KL University for 3 years.

He has extensive knowledge of administrative system, maintaining statutory norms of bodies like AICTE, UGC etc and has a good understanding of NBA, NAAC procedures and norms. He served as Member, Chairman of Board of Studies at JNTU(A), KLCE(Autonomous) and KL University.

OFFICE OF DEAN ACADEMICS

Hari Kiran Vege
Dean (Addl) Academics

Dr. V N Sailaja
Associate Dean Academics
(Curricular Aspects)

Dr. P Kasi Visweswara Rao
Associate Dean Academics
(Curricular Aspects)

Dr. M Kameswara Rao
Associate Dean Academics
(Academic Registrations)

Dr. M Venkata Naresh
Associate Dean Academics
(Strategic Planning & Policy Making)

Dr. K Uday Kiran
Associate Dean Academics
(Academic Registrations)

Dr. N V K Ramesh
Associate Dean Academics
(Teaching & Learning Process)

Dr. Padmanabhan K
Associate Professor, CSE

Dr. Aravindhan Alagarsamy
Associate Dean Academics
(Teaching & Learning Process)

Dr. B Chaitanya Krishna
Associate Dean Academics
(OBE & Evaluation)

Dr. S Balaji
Associate Dean Academics
(Off-campus Operations)

Dr. E Vamsidhar
Associate Dean Academics
(OBE & Evaluation)

Dr. P Vidya Sagar
Associate Dean Academics
(Projects, Academic Research & Internships)

Mr. A Gopi
Assistant Dean Academics
(Projects, Academic Research & Internships)

Dr. Fazal Noor Basha
Associate Dean Academics
(Academic Counselling)

Dr. M Latha
Associate Dean Academics
(Academic Counselling)

Dr. A S Chandra Sekhara Sastry
Controller of Examinations

Dr. Ch V Ramana Murthy
Addl. Controller of Examinations

Dr. Chakka Raghava Prasad
Addl. Controller of Examinations

Dr. Chetty Manna Sheela Rani
Addl. Controller of Examinations

Dr. Sreevardhan Cheerla
Addl. Controller of Examinations

Dr. Kallakunta Ravi Kumar
Addl. Controller of Examinations

Dr. M V V K Srinivas Prasad
Asst. Controller of Examinations

Dr. Kallipalli Venkata Raju
Addl. Controller of Examinations

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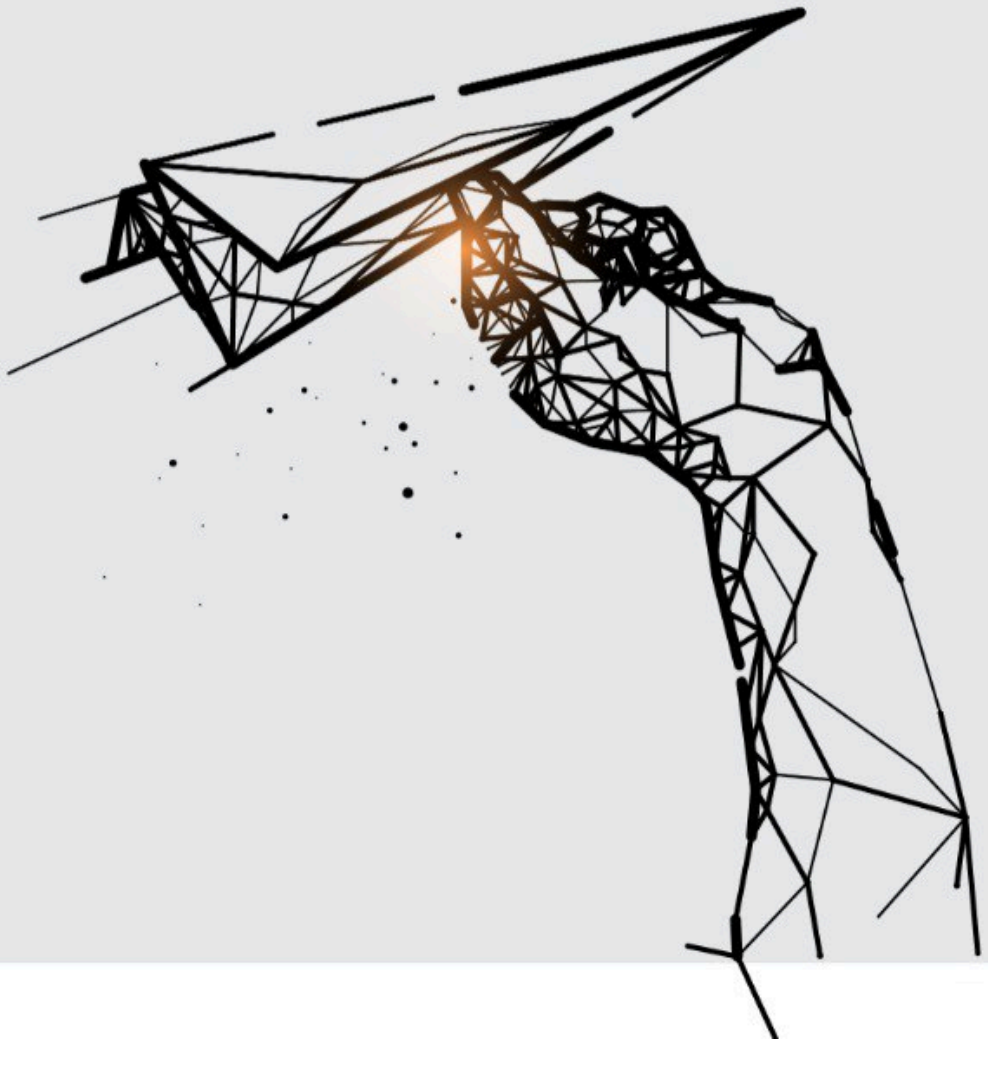
VISION

To be an excellent Centre for promoting students towards Civil Service Examinations in addition to Arts and Humanities.

MISSION

To impart quality education for enriching the inherent qualities of studies by implementing sufficient inputs and to make them competent to appear for Civil Service and other competitive examinations.



Y24: Bachelor of Arts (Economics & Public Policy)

Program Handbook

Program Educational Objectives (PEOs)

PEOs

PEO	PEO Description
1	Graduate will be able to exhibits their skills in Literature and diverse literary works.
2	Graduate will be able to analyze the aspects of History, Geography, Public Administration and Economy
3	Graduate will be to apply knowledge, information and research skills to complex problems in the field of Social Science and Humanities.

Program Outcomes & Program Specific Outcomes (PO & PSO)

PO & PSO

PO/PSO	PO/PSO Description
PO1	Provide knowledge and understanding of various fields of study in core disciplines in the Humanities and social sciences with special reference to Economics and Public Policy.
PO2	Develop critical and analytical skills to identify and resolve of problems with in complex changing social, linguistic and literary context
PO3	Understanding the general concepts and principles of selected areas of study outside core disciplines of the Humanities, Social Science and Languages
PO4	Follow independence in learning appropriate theories and methodologies with intellectual honesty and an understanding of ethical and human values.
PO5	Encourage students to analyze the problems and apply this knowledge for remedies thereof.
PO6	Enhance students skills of effective communication and language learning i.e. reading, writing, listing and speaking another language with fluency and understand its cultural value
PO7	Inducting the sense of environmental albitites and provide knowledge on climate change and community responsibility of the citizen.
PO8	Work with self-esteem, self-reliance, self-reflection and creativity to face adversities in the work and personal.
PO9	Inculcate leadership and administrative abilities for their future career.
PO10	Increase inclination for higher studies and research in social sciences and gain comprehensive knowledge to succeed in competitive examinations.
PSO1	Identify and address issues with the economy, business, government, and society.
PSO2	Lessons from the demanding, interdisciplinary, and globally recognised curriculum with objectivity and critical thinking.
PSO3	Competent at formulating appropriate research questions and using research methodologies to solve practical issues

Program Rules & Regulations

Admission Eligibility Criteria

A Pass in 10+2 or equivalent examination with 55% and above (or) equivalent CGPA.

Program Structure and Curriculum

For each academic program, the curriculum serves as a framework that specifies the credits, course category, codes, titles, and delivery methods (Lectures, Tutorials, Practice, Skills, Projects, Self-Study, Capstone Design, etc.) under the **Choice-Based Credit System (CBCS)**. The curriculum is designed, implemented, and assessed following the **Outcome-Based Education (OBE)** framework.In designing the curriculum, we ensure the integration of key contemporary and traditional values by embedding Indian Knowledge Systems (IKS), Sustainable Development Goals (SDGs), and Design Thinking principles into courses at their inception.

- Each **Academic Year** consists of two regular semesters, each approximately 20 weeks including classwork and exams:
    - **Odd Semester:** July to December
    - **Even Semester:** December to May
- A **Summer Term** may be offered from May to June but is not considered a regular semester for calculating program duration.
- Students have the flexibility to choose courses as prescribed by KLEF.
- Each course has a **Lecture-Tutorial-Practice-Skill (L-T-P-S)**component.

Course Credit Structure:

Credits are allocated to courses based on the **L-T-P-S** structure:

- Every **Lecture** or **Tutorial** hour equals **1 credit**.
- Every **Practical** hour equals **0.5 credits**.
- Every **Skill-based practice** hour equals **0.25 credits**.

Course Precedence:

The following are the guidelines for registering into courses with pre-requisites.

- A course may have one or more of its preceding course(s) as pre- requisite(s).
- To register for a course, the student must successfully be promoted in these course(s) earmarked as pre-requisite(s) for that course.

Academic Flexibilities

Major Flexibilities:

- **Honors:** Honors can be awarded if students complete additional courses from their core program and earn 40 extra credits through specified category of courses.

- **Honors through Research:** Honors through Research offers students the chance to explore their chosen field of study in greater depth, cultivate valuable research skills, and make meaningful contributions to their specific area of interest. Students can be awarded this Degree upon fulfilling the requirement of earning an additional 40 credits through specified category of courses.

- **Honors through Innovation:** Honors through Innovation emphasize the exploration of innovative ideas, problem-solving, and creative thinking within a particular field of study. It may provide opportunities for students to engage in innovative projects, research, or entrepreneurial activities. Students can be awarded their degree upon successful completion of additional courses from their core program and earning an extra 40 credits through specified category of courses.

- **Honors through Experiential Learning:** Honors through Experiential Learning focuses on hands-on, practical experiences that complement and enhance traditional classroom learning. Students will be eligible for the degree upon the successful completion of additional courses from their core program and the attainment of 40 extra credits through specified category of courses.

For the above said categories, if a student fails to meet the CGPA and SGPA requirements, at any point after registration, she/he will be dropped from the list of students eligible for the specified Degree, then student will receive Bachelors Degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

Program Add-ons:

- **Specialization:** Specialization degree can be awarded if student completes five professional electives and one skill development course in the same track of his/her interest.

- **Minor:** Minor degree can be awarded if student fulfills all the program requirements of their discipline and are successful in completing a specified set of courses from another discipline through which they earn an additional 20 credits are eligible to get minor degree in that discipline.

- **Double Major:** Double Major degree can be awarded if student earns 40 additional credits from the selected second major stream in addition to fulfilling the requirements of their first major.

	No Major **Flexibility**	Major Flexibility **Honors**	Major Flexibility **Honors through Research**	Major Flexibility **Honors through Innovation**	Major Flexibility **Honors through Experiential Learning**
No Program Add-On	B.A	B.A (Honors)	B.A (Honors through Research)	B.A (Honors through Innovation)	B.A (Honors through Experiential Learning)
Program Add-On **Specialization**	B.A with Specialization	B.A (Honors) with Specialization	B.A (Honors through Research) with Specialization	B.A (Honors through innovation) with Specialization	B.A (Honors through Experiential Learning) with Specialization
Program Add-On **Minor**	B.A with Minor	B.A (Honors) with Minor	B.A (Honors through Research) with Minor	B.A (Honors through Innovation) with Minor	B.A (Honors through Experiential Learning) with Minor
Program Add-on **Double Major**	B.A with Second Major	B.A (Honors) with Second Major	B.A (Honors through Research) with Second Major	B.A (Honors through innovation) with Second Major	B.A (Honors through Experiential Learning) with Second Major

Registration Process

Key Guidelines:

- **Course Availability:** Students are permitted to register only for courses offered in the specific semester of enrollment.
- **Prerequisites:** Any prerequisite courses must be successfully completed before registering for subsequent courses.
- **Timely Registration:** Students must register on the designated registration day. KLEF reserves the right to deny late registrations.
- **Add/Drop/Change Period:** Students have a one-week window from the start of classes to add a course and two-weeks to drop or change courses.
- **Credit Limits:**
  - The recommended credit load is 22-24.
  - The maximum credit load per semester is 30.
  - If a student finds the standard load overwhelming, they can opt for deceleration, taking fewer courses now and making up the credits in a future summer semester.
  - Students in honors programs or pursuing a minor may be allowed to take on a heavier load through overloading, subject to eligibility criteria.
- **Elective Course Availability:** KLEF may cancel elective courses with low enrollment within the first week. Students will be able to switch to another elective if they meet its prerequisites.
- **Re-registration:** If a student wants to improve their grade in a course, they can re-register for it with approval from the Dean of Academics.
- **Registration Cancellation:** KLEF can cancel a student's registration for disciplinary reasons or plagiarism.
- **Timetable Clashes:** Students are responsible for resolving any timetable conflicts. They should contact their Department Year Coordinator immediately if any clashes arise.
- **Irregularities:** If any irregularities are found in a student's registration later on, KLEF may cancel their registration for a course or even the entire semester.

Registration Flexibilities:

- **Choice of electives:** Students have the flexibility to choose from a diverse set of elective courses that align with their personal interests or career objectives.
- **Choice of faculty:** Students have the flexibility to choose their preferred faculty members for certain courses, depending on departmental policies and course availability.
- **Acceleration & Overloading:** Students can accelerate their progress by taking courses from the next semester in advance, or overload by taking more credits than the standard limit. Prior permission from the Dean of Academics is required for either of these.
- **Deceleration & Underloading:** If students need to lighten their course load, they can decelerate by postponing some courses to the next semester, or underload by taking fewer credits than usual. Students who do not register on time, may also be forced to decelerate to compensate the classwork that they missed due to late registration. In both the cases of deceleration, permission must be sought from Office of Dean Academics through proper channel.

- **Special Purpose Semesters:**
  - Innovation Semester: An Innovation Semester is a dedicated academic term focused on cultivating a culture of creativity, problem-solving, and entrepreneurial thinking. It provides students with the opportunity to develop innovative solutions to real-world challenges.
  - Product Development Semester: A Product Development Semester is an academic term dedicated to the process of creating new products or improving existing ones. It provides students with hands-on experience in the entire product lifecycle, from ideation to market launch.
  - Rapid Prototyping Semester: A Rapid Prototyping Semester is an academic term dedicated to the practical application of rapid prototyping techniques to create physical models or prototypes of products or designs. It provides students with hands-on experience in transforming digital designs into tangible objects.
  - Research Semester: A research semester is a dedicated period within an academic program focused on independent research or scholarly inquiry. It provides students with the opportunity to delve deep into a specific research topic or project under the guidance of a faculty mentor.

Summer Term Registration:

The Summer Term is designed to help students catch up or get ahead. Here are the guidelines:

- **Eligibility:** Students can register for summer courses if they have backlogs to clear, need to fulfill pre-requisites, or have been approved for acceleration.

- **Credit Limit:** The maximum credit load for the summer term is 12.

- **Timetable Clashes:** Students should ensure there are no conflicts in their summer course schedule.

- **Attendance & Promotion:** The same policies apply as in regular semesters, except that attendance condonation is not available in the summer.

Course Categories

- **Humanities, Arts and Social Sciences (HAS)**: The Humanities, Arts, and Social Sciences (HAS) category encompasses a diverse range of academic disciplines designed to broaden students' perspectives beyond their core areas of study. As part of the undergraduate curriculum, students can choose from a variety of courses within this category, including Foreign Language Electives and Management Electives. These courses offer valuable opportunities for students to develop skills in communication, cultural understanding, and management, complementing their technical education and fostering a well-rounded academic experience.

- **Basic Science Courses (BSC):** The Basic Science category covers key courses in subjects like Mathematics, Physics, and Chemistry, providing a strong scientific foundation for undergraduate students. This category includes Mathematics Electives and Science Electives, offering students the flexibility to choose courses that align with their interests. These courses help develop essential problem-solving and analytical skills, which are critical for understanding advanced concepts in their field. Basic Science courses also play a vital role in applying scientific principles to real-world engineering and research challenge.

- **Engineering Science Courses (ESC)**: The Engineering Science category comprises foundational engineering courses that introduce students to essential principles and methods used in various engineering fields. These courses provide the necessary technical background and practical knowledge required for more advanced study and specialization in engineering disciplines.

- **Professional Core Courses (PCC):** Professional Core Courses (PCC) are essential courses within each engineering discipline that provide foundational knowledge and skills critical to the field. These courses are integral to the curriculum and ensure that students acquire the core competencies necessary for their professional practice.

- **Flexi Core Courses (FCC):** Flexi Core Courses offer students a degree of flexibility within their core curriculum. These courses are designed to complement the professional core courses while allowing students to select topics that align with their career goals and personal interests. Flexi Core Courses are integral to ensuring that students receive a comprehensive education while exploring specialized areas that may not be covered in the traditional core courses.

- **Skill Development Courses (SDC):** Skill Development Courses are designed to equip students with practical, hands-on skills that enhance their employability and professional capabilities. These courses often focus on soft skills, technical proficiency, and industry-relevant competencies, such as communication, teamwork, leadership, digital literacy, and industry-specific software tools. By offering both theoretical knowledge and practical training, these courses help bridge the gap between academia and the professional world.

- **Professional Elective Courses (PEC)**: Professional Elective Courses (PEC) are required for students who wish to pursue a specific specialization within their field of study. These courses allow students to focus on advanced topics and gain in-depth knowledge in their area of interest, tailoring their education to align with their career goals. By completing the designated PECs, students can achieve a degree of specialization that enhances their expertise and prepares them for specific roles or industries in their professional journey.

- **Project Research and Internship (PRI):** Project Research and Internship courses provide students with real-world experience by engaging them in research projects and internships in industry or academia. These courses are essential for developing practical problem-solving skills, fostering innovation, and giving students the opportunity to apply the theoretical knowledge gained in the classroom to real-life scenarios. Through internships and research projects, students can gain industry exposure, improve their technical skills, and prepare themselves for professional careers or advanced studies.

- **Open Elective Courses (OEC):** Open Elective Courses offer students the flexibility to explore subjects outside their core discipline, fostering interdisciplinary learning and intellectual diversity. Available across all university programs, these courses encourage students to integrate knowledge from various fields, promoting innovation and a holistic understanding of global issues. Open Electives play a key role in broadening student academic perspectives and preparing them for multifaceted professional challenges.

- **Value-Added Courses (VAC):** Value-Added Courses are designed to enhance employability by providing students with training that leads to globally recognized certifications or specialized skills. These courses focus on industry-relevant knowledge and practical applications, ensuring students are well-prepared for current job market demands. By offering advanced skills and certifications, Value-Added Courses give students a competitive edge in their careers.

- **Social Immersive Learning (SIL):** Social Immersive Learning (SIL) is an informal learning approach facilitated through the Student Activity Centre, where students earn credits by actively participating in a wide range of events. These include Extension, Social & Outreach Events, Technology Club Events, Literary, Hobby & Cultural Events, Innovation, Incubation & Entrepreneurship Events, and Health & Well-Being Events. SIL emphasizes experiential and activity-based learning, fostering personal growth and social engagement. The course is evaluated based on the points students accumulate through their involvement, offering a flexible, real-world learning experience that complements their formal education.

- **Bridge Courses:** Bridge Courses are designed to address academic gaps and ensure continuity between Basic Sciences, Engineering Sciences, and Professional Courses. These courses, identified through gap analysis and stakeholder feedback, serve as a foundation for students, helping them transition smoothly between academic levels or disciplines. Bridge Courses reinforce fundamental concepts and skills, preparing students for more advanced coursework in their academic programs.

- **Audit Courses (AUC):** Audit courses are courses that students can attend without receiving a formal grade or credit towards their degree. These courses are often chosen by students who want to learn a subject for personal enrichment or to gain knowledge in areas outside of their major.

- **Honors Flexi Core Courses (HFC):** Honors Flexi Core Courses (HFC) provide students pursuing honors programs with the flexibility to choose from a range of core courses tailored to their specific academic interests and career goals. These courses are designed to offer advanced content and greater depth in core subjects, allowing students to personalize their academic journey while fulfilling the requirements of their honors program.

- **Honors Through Research Courses (HRC):** Honors Through Research Courses (HRC) enable students to engage in in-depth research projects as part of their honors curriculum. These courses focus on developing student research skills, critical thinking, and analytical abilities, allowing them to contribute original knowledge to their field of study. Through hands-on research experiences, students gain valuable insights and prepare for advanced academic or professional pursuits.

- **Honors Through Innovation Courses (HIC):** Honors Through Innovation Courses (HIC) emphasize creativity and innovation within the honors program framework. These courses encourage students to explore cutting-edge technologies, develop novel solutions to real-world problems, and engage in entrepreneurial activities. By focusing on innovation, students can apply their learning to create impactful projects and drive advancements in their areas of interest.

- **Honors Through Experiential Learning Courses (HEC):** Honors Through Experiential Learning Courses (HEC) integrate practical, hands-on experiences with academic study. These courses offer students opportunities to apply theoretical knowledge in real-world settings through internships, fieldwork, or community projects. HEC courses aim to enhance student learning by providing experiential opportunities that complement their honors education and contribute to their personal and professional development.

- **Minor Degree Courses (MIN):** Students pursuing a Minor Degree must complete a designated set of Minor Degree Courses. These courses are carefully selected to provide a structured and cohesive understanding of the minor subject, complementing the student's major field of study. By fulfilling these requirements, students gain specialized knowledge and skills in an additional discipline, which enhances their overall academic profile and broadens their career opportunities.

- **Minor Skill Development Courses (MSDC):** Minor Skill Development Courses (MSDC) must be completed as part of the selected minor degree. These courses are designed to provide targeted skill-building opportunities relevant to the minor field, focusing on practical and industry-specific competencies. By engaging in MSDC, students develop specialized skills that complement their major and enhance their overall expertise, making them more versatile and competitive in their chosen career paths.

- **Second Major Flexi Core Courses (SMFC):** Second Major Flexi Core Courses (SMFC) are designed for students pursuing a second major, offering flexibility in selecting core courses that meet the requirements of both their primary and secondary majors. These courses allow students to integrate and balance the demands of two distinct fields of study, providing a comprehensive educational experience across discipline.

Requirements for the award of Degree

To be eligible for the award of a B.A. degree, a student must successfully fulfill the following criteria:

- **Credit Requirements:** Earn the minimum number of credits specified in the program structure.

- **Focused Training:** Successfully undertake specific training in focused areas that enable students to be successful in their chosen career tracks. The focused areas are: (a) Employment in MNCs, (b) Civil Services (c) Higher Studies (d) Research and (e) Entrepreneurship.

- **Certifications:** Successfully complete at least two global certifications or value-added courses in the chosen discipline.

- **Internships:** Successfully complete Summer Internships outlined in the program structure.

- **Audit Courses:** Successfully complete all audit courses outlined in the program structure.

- **Minimum CGPA:** Achieve a minimum Cumulative Grade Point Average (CGPA) of 5.25 by the end of the program.

- **Extra Courses:** Students with extra courses having 'DT' or 'F' grades can still graduate if they meet all other requirements. However, these courses will be factored into the CGPA calculation.

- **Time Limit:** Complete all requirements within:
    - A minimum of 6 regular semesters (excluding summer terms)
    - A maximum of 6 years

Note: *The student is awarded a B.A. (Honors / Specialization / Minor / Double Major) degree based on the chosen academic flexibility, provided they fulfill all the credit and outcome requirements specified for each degree (refer to degree-wise requirements under Design your own Degree) in addition to meeting the regular B.A. degree requirements mentioned above.*

Multiple Entry and Exit System

Multiple Entry and Exit System (MEES) empowers students to make their own academic decisions, allowing them to rejoin their studies at a later point and achieve their career goals. As per NEP guidelines, undergraduate degrees can be three or four years long, with multiple entry and exit points. Students can earn certificates, diplomas, or degrees based on their progress.

Entry and Exit Options:

- 1st Year (Level 5 - Undergraduate Certificate):
    - Entry: Secondary School Leaving Certificate (Grade 12/Intermediate)
    - Exit: Certificate in the respective discipline (40 credits + 4 skill development credits)

- 2nd Year (Level 6 - Undergraduate Diploma):
    - Entry: Completion of the first year with a certificate.
    - Exit: Diploma in the respective discipline (80 credits + 4 skill development credits, with at least 40 credits at Level 6)

- 3rd Year (Level 7 - Bachelor's Degree):
    - Entry: Completion of two years with a diploma
    - Exit: Bachelor's degree in the respective discipline (120 credits + 4 skill development credits across Levels 5, 6, and 7)

- 4th Year (Level 8 - Bachelor's (Honors) Degree):
    - Entry: Completion of a three-year Bachelor's degree with a minimum CGPA of 7.5.
    - Exit: Bachelor's (Honors) degree in the respective discipline (minimum 160 credits from Levels 5 to 8).

Note: *These degree levels align with the NHEQF. While the student is provided with MEES, the maximum time limit for completion of degree must still be adhered for the award of degree.*

Academic Bank of Credits

- ABC helps the students to digitally store their academic credits from any higher education institute registered under ABC in order to award Certificate/Diploma/Degree/Honors based on the credits earned by the student.
- All the credits acquired by the students are stored digitally by registering into Academic Bank of Credits (ABC) portal. It also supports retaining the credits for a shelf period and continue their program study with multiple breakovers.
- Students may exit from their current program of study due to any unforeseen reasons or to focus on their chosen career path. In such cases, the student may break for a period of time (preferably not in the middle of an academic year) and may continue with the program of study at a later stage.
- Students must be able to complete their program by not exceeding the maximum duration of the program. If not, they may be issued with a Certificate, diploma, degree or honors based on the credits acquired over the period of time for all the programs approved by UGC.

Award of Class

A student having cleared all the courses and met all the requirements for the award of degree with:

- **Pass class:** CGPA greater than or equal to 5.25 and lesser than 5.75.
- **Second class:** CGPA greater than or equal to 5.75 and lesser than 6.75.
- **First class:** CGPA greater than or equal to 6.75 and lesser than 7.75
- **First class with Distinction:** CGPA greater than or equal to 7.75, provided the student has cleared all the courses in first attempt and must have fulfilled all the program requirements in program specified minimum years duration.

Award of Medals

KLEF awards Gold and Silver medals to the top two candidates in each program after successful completion of their study. The medals are awarded based on their CGPA during the Annual Convocation with the following constraints:

- The grade obtained through betterment/ supplementary will not be considered for this award.
- He/She must have obtained first class with distinction for the award of Gold or Silver-medal.

Course Flexibilities

In line with the institution's commitment to personalized learning, courses are offered in multiple modes, allowing students to tailor their academic journey based on personal preferences, career goals, and learning styles. The available modes include:

- **Regular Mode:** It is the traditional method of learning, involving in-person classroom instruction, a structured curriculum, and traditional assessments. This mode provides students with a structured and predictable learning environment, facilitating direct interaction with professors and classmates. It is suitable for students who prefer a traditional learning approach and value face-to-face interaction.

- **Advanced Mode:** This mode is designed for students seeking a more rigorous academic experience, this mode offers additional credits, in-depth theoretical studies, research projects, and complex problem-solving evaluations. It is particularly suitable for students participating in honors programs.

- **Experiential Mode:** This mode emphasizes practical learning through real-world projects, lab work, or industry interactions. It offers variable credits based on the extent of practical involvement and assessments centered around project outcomes and presentations. Honors students pursuing experiential learning often choose this option.

- **MOOCs Mode:** Massive Open Online Courses (MOOCs) are utilized to support independent learners, such as students engaged in internships or practice school. Students can earn credits by completing accredited online courses at their own pace. Assessments in this mode may include online quizzes, certifications, and institutional evaluations.

- **Work-in-lieu Mode:** It allows students to substitute certain coursework with relevant work experience, internships, or on-the-job training. Credits are awarded based on the work performed, and evaluations are typically centered around performance reports, supervisor evaluations, and reflective essays. This mode is ideal for students who want to gain practical experience while fulfilling academic requirements.

Attendance calculation in a course

- **Attendance calculation for LTPS:** Attendance of a student on a course is calculated based on the credit-weighted average of the student's attendance in each of the LTPS components of the course.

- **Attendance start date:** Attendance is counted from the class commencement date. However, for transferred or newly admitted students, attendance in their admitted semester is counted from the date of admission.

Attendance requirements leading to promotion

- **Minimum Attendance:** 85% attendance is required for course promotion and appearing for the semester-end exam.
- **Condonation:** Up to 10% condonation by Principal, is possible for medical emergencies with proper documentation submitted within a week. Students will be levied a condonation fee to appear for the semester-end exam.
- **Marginal Cases:** Attendance slightly below 75% due to severe medical or valid reasons may be considered for further relaxation by the condonation board appointed and headed by the Vice-Chancellor.

Attendance-based marks

- **Optional Marks:** Course coordinators can allocate up to 5% of the total marks for attendance, clearly stated in the course handout and approved by the Dean of Academics through proper channel.

- **Mark Distribution:** Marks are awarded based on attendance ranges: 85-88% = 1 mark, 89-91% = 2 marks, and so on. Below 85% results in zero marks, even with condonation.

- **Applicability:** Attendance marks, if given, apply to all L-T-P-S components cumulatively, not just the theory part.

Attendance waiver

- **Eligibility:** Students with a CGPA and SGPA of 9.00 or higher in the previous semester can get an attendance waiver for up to three courses in the next semester, with prior approval from the Dean of Academics through proper channel.

- **Conditions:** Students using the attendance waiver can participate in all assessments and evaluation components without being marked ineligible due to attendance-based regulations.

Compensatory (Extra) attendance policy

- **Eligibility:** Students representing KLEF in events or participating in co-curricular / extracurricular activities can get compensatory attendance with prior written approval.

- **Limit:** Compensation is limited to 10% of total classes per course per semester and doesn't apply to the summer term.

Course-based promotion and detention policy

- **Minimum Attendance:** Students must meet the minimum attendance requirement to be promoted in a course. If a student fails to meet this requirement, their grade in the course will be marked as "DT", indicating that the student is detained in the course.

- **Next Steps after detention:** Student must re-register in a detained course and study it completely by attending the classwork, submitting all assessments, taking all evaluation components

Eligibility for appearing Sem-End Examination

A Student registered for a course and got promoted is eligible to write the Semester End Examination for that course unless found ineligible due to one or more of the following reasons:

- Shortfall of attendance.
- Acts of indiscipline.
- Withdrawal from a course.
- Non-payment of examination fees.
- Without a hall ticket.

Assessment & Evaluation

The assessment in each theory subject consists of Sem In Exams, in class quizzes/tutorials/home-assignments/Active Learning Methods (continuous assessment) and the Semester End Exanimation (SEE). Students are advised to refer to the course handout to get more detailed information on assessment.

- Sem In Examinations and the Semester End Examinations will be conducted as per the Academic Calendar.
- As per the necessity, the Supplementary examinations will be conducted at the discretion of Dean Academics with the approval of the Vice Chancellor.
- Students may have to take more than one examination in a day during Sem In exams, Semester End Examinations /Supplementary examinations.

College / School Name	Semester-In Evaluation (Weightage in percent) (A)	Sem End Examination (Weightage in percent) (B)	Minimum requirement for pass percent	
			(A+B)	B
College of Arts & Sciences	60	40	40	40

Semester-In Evaluation

The following guidelines are followed for the Semester In evaluation.

- The process of evaluation is continuous throughout the semester
- The distribution of marks for Semester In evaluation is 60 percent of aggregate marks of the course.
- The distribution of weightage for various evaluation components are decided and notified by the course coordinator through the course handout after approval by the Dean Academics, prior to the beginning of the semester.
- In order to maintain transparency in evaluation, answer scripts are shown to the students for verification, within one week of conduct of exam. If there is any discrepancy in evaluation, the student can request the course coordinator to re-evaluate.
- The solution key and scheme of evaluation for all examinations are displayed by the Course Coordinator in the appropriate web portal of the course, on the day of the conduct of examination.
- In case the student is unable to appear for any evaluation component owing to hospitalization, participation in extra/ co-curricular activities representing KLEF/ state/ country; the Dean Academics can permit to conduct of re-examination for such students.
- In case a student has missed any of the two in semester evaluations, S/he is eligible for and will be provided with an opportunity of appearing for re-examination.
- The pattern and duration of such examination are decided and notified by the Course Coordinator through the Course handout, after approval from the Dean Academic.
- To maintain transparency in evaluation, answer scripts are shown to the students for verification. If there is any discrepancy in evaluation, the student can request the Controller of Examinations to re-evaluate.
- If a student earns F grade in any of the courses of a semester, an instant supplementary exam (for only Semester End Exam component) will be provided within a fortnight of the declaration of the results.

Semester-End Evaluation

The following guidelines are followed for the End Semester evaluation.

- The end-semester evaluation typically includes a variety of components such as Sem End Exams, projects, presentations, or practical assessments, skill assessments as detailed in the course handout.
- Each component is evaluated based on the criteria outlined in the course handout.
- The distribution of weightage for various evaluation components are decided and notified by the course coordinator through the course handout after approval by the Dean Academics, prior to the beginning of the semester.
- To pass in a course, student must meet or exceed the minimum passing marks specified for each end semester summative assessment component mentioned in the course handout.
- The key and scheme of evaluation for all examinations are displayed by the Course Coordinator in the appropriate web portal of the course, on the day of the conduct of examination.
- In case the student is unable to appear for any Sem end summative evaluation component owing to hospitalization, participation in extra/ co-curricular activities representing KLEF/ state/ country; student can request for re-examination by taking prior permission from Dean Academics.
- If a student earns F grade in any of the courses of a semester, an instant supplementary exam (for only Semester End Exam component) will be provided within a fortnight of the declaration of the results.

Absence in Assessment and Examination

If a student misses a formative assessment component (quizzes, assignments, etc.) due to illness or other valid reasons, no retakes will be permitted, and a score of zero will be recorded. However, in cases of an excused absence, the instructor may allow the student to retake the assessment, subject to written approval from both the Principal and the relevant Head of Department.

Make-up Exams:

A student's absence from Semester In or Semester End Exams will only be considered for a make-up exam under the following circumstances.

- Pre-approved participation in university/state/national/international co-curricular or extracurricular activities.
- Illness or medical emergencies resulting in hospitalization, with a doctor's certification explicitly stating the student's inability to attend the exam within the designated period.
- Death of an immediate family member.

Remedial Exams:

- Remedial exams are conducted for students who score less than 60% on Semester In Exam I and have attended at least 85% of the remedial classes.
- For courses without remedial classes, no remedial exam will be scheduled.
- If a student does not take or scores less than 60% on Semester In Exam I, they must attend remedial classes and maintain a minimum 85% attendance to be eligible for the remedial exam. The remedial exam score will then be considered.
- The number of remedial classes will be 33% of the regular classes held prior to Semester In Exam I. However, there are no remedial exams for Semester In Exam II or laboratory exams.

Remedial Classes Policy

The following categories of students are recommended to attend Remedial classes:

- Students who did not attend or obtain a minimum of 60 percent marks in the Sem In exam1.
- Students for whom CO1/CO2 is (are) not attained in Sem In Exam 1
- Any other student may also be permitted to attend remedial classes as per the discretion of the principal.

The following are the guidelines to conduct remedial classes:

- Remedial classes which are scheduled to be conducted usually one or two weeks post conclusion of Sem In exam1.
- The number of remedial classes to be conducted shall be 33 percent of regular classes held till the Sem In exam I.
- Remedial classes MUST NOT be scheduled during regular class work hours.

Assessment of Project/Research based Courses

- All project or research-based subjects must have a defined time limit for completion.
- The specific time limits for completion and schedule for monitoring and evaluation of performance of students will be announced each term.
- The final project report, after getting the plagiarism certificate, only will be considered and evaluated by the panel of examiners.
- Student project reports must follow the guidelines prescribed by the office of Dean Academics.

Grading Process

At the end of all evaluation components based on the performance of the student, each student is awarded based on absolute/relative grading system. Relative grading is only applicable to a section of a course in which the number of registered students is greater than or equal to 25. Choice of grading system is decided by the Course Coordinator with due approval of Dean Academics and is specified in the course handout.

(i) Absolute Grading:

The list of absolute grades and its connotation are given below:

Performance	Letter Grade	Grade Point	Percentage of marks
Outstanding	O	10	90 - 100
Excellent	A+	9	80 - 89
Very Good	A	8	70 - 79
Good	B+	7	60 - 69
Above Average	B	6	50 - 59
Average	C	5	46 - 49
Pass	P	4	40 - 45
Fail	F	0	0 - 39
Absent	AB	0	Absent

(ii) Relative Grading:

The following table lists the grades and its connotation for relative grading:

Letter Grade	Grade Point	Grade Calculation
O	10	total marks >= 90% and total marks >= mean + 1.50σ
A+	9	μ+0.50σ <= total marks < μ+1.50σ
A	8	μ <= total marks < μ+0.50σ
B+	7	μ-0.50σ <= total marks < μ
B	6	μ-1.00σ <= total marks < μ-0.50σ
C	5	μ-1.25σ <= total marks < μ-1.00σ
P	4	μ-1.50σ <= total marks < μ-1.25σ or ≥40
F	0	total marks <μ-1.50σ or total marks <=39
AB	0	Absent

μ is the mean mark of the class excluding the marks of those students who scored greater than or equal 90 percent and less than or equal 40 percent after rounding the percentages to the next highest integer. σ is the standard deviation of the marks.

Course handout

A course handout is a document that provides essential information about a specific course. It's like a roadmap that guides you through the course, helping you understand the expectations, assignments, and grading criteria.

Significance of Course Handout:

- **Clarity and Organization:** Course handouts help you stay organized and focused by outlining the course structure, topics, and deadlines.
- **Expectations:** They communicate the instructor's expectations for your participation, assignments, and overall performance.
- **Grading:** Course handouts outline the grading criteria, so you know exactly how your work will be evaluated.
- **Resources:** They often list valuable resources, such as textbooks, articles, or online tools, that can aid your learning.

Expectations from the course handout:

- **Course Description:** A brief overview of the course, its goals, and its relevance to your studies.
- **Learning Outcomes:** Clear goals for what you should be able to do by the end of the course. These outcomes will help you understand the skills and knowledge that are expected to gain.
- **Instructor Information:** Contact details, office hours, and specific communication preferences.
- **Course Schedule:** A tentative timeline of topics, assignments, and exams.
- **Required Materials:** A list of textbooks, articles, or other materials essential for the course.
- **Assessment Methods:** A breakdown of how your final grade will be determined, including the weight of assignments, exams, and participation.
- **Assignment Guidelines:** Detailed instructions for each assignment, including due dates, submission requirements, and expectations.

Effective use of the course handout:

- **Refer to it regularly:** Check back to keep track of important dates and assignments.
- **Highlight key points:** Make notes or highlight sections that are particularly important to you.
- **Ask questions:** If something isn't clear, bring it up in class or during office hours.

Betterment

- A student may reappear for the semester-end examination for betterment, only in the theory part of a course to improve their grade, provided that the student has passed the course, his/her CGPA is less than or equal to 6.75 and the grade in the respective course is equal to or lower than a 'C'. In case of reappearing for a course, the best of the two grades will be considered.

- A student may re-register for any course in any semester during the program to improve their grade if the current grade in the course is lower than 'B+', with the approval of the Dean Academics and in accordance with academic regulations.

- A student cannot reappear for the semester-end examination in courses with an L-T-P-S structure such as 0-0-X-X, 0-0-X-0, 0-0-0-X, Social Internship, Technical Internship, Seminar, Term Paper, Project, Capstone Project, Practice School, Industrial Internship.

- A student is not eligible for the award of a Degree with Honors if they opt for the betterment option.

Supplementary

- A student is eligible for a supplementary exam if they don't meet the minimum passing marks for a course or if they fail any component of the end-of-semester assessments listed in the course handout.

- If a student has failed courses from a previous odd semester that are not offered in the current semester, the supplementary exams for those courses will be scheduled for the summer supply.

- As per the end semester assessment components listed in the course handout (i.e. end semester summative) if student fail any component, they are eligible for a supplementary exam. Only the component(s) student failed will be considered for this supplementary attempt, though in some cases, you might be allowed to retake all components to improve your marks.

- If a student fails any of the end-of-semester examinations in an odd semester, supplementary exams for the current semester's courses will be conducted within one month after the release of the results. These supplementary exams will only cover the courses offered in that specific odd semester.

- In cases where there is a clash between odd semester supplementary exams and other scheduled exams, students may take the supplementary exams during the summer supply.

- If a student fails any of the end-of-semester examinations in an even semester, supplementary exams will be scheduled either within one month after the release of the results (i.e. summer supply) or during the summer term.

- Student must register for supplementary exams within a specified period after the results are declared.

- Student may be required to pay a supplementary exam fee. Details on the fee structure and payment process will be provided along with the supplementary exam notification.

- A student is not eligible for the award of a degree with first class with Distinction, if they opt for the Supplementary option.

Revaluation

Students desirous of seeing their Semester End Examination answer scripts have to apply online to the COE for the same within the timeframe as declared by the COE by paying the prescribed fee through ERP. Student applications must be forwarded by the Head of the Department and the Principal of the School and then re evaluation fees are to be paid. The application along with the attached fee receipt must be submitted to the office of the COE.

- There is no provision for re evaluation in case of Lab/Practical/skilling exams, project, viva voce exam or seminar / design / mini project courses.
- The final grades awarded to each course shall be announced by the COE and the same will be made available to students through the website/notice boards.

Credit Transfer

Credit transfer between KLEF and other Institution:

Credit transfer from other institutions to KLEF or vice versa is permitted only for undergraduate program.

Credit transfer from KLEF to other institutions: Student studying in KLEF can take transfer to another institution under the following conditions:

- KLEF has signed MOU with the institution

- However, a student, after seeking transfer from KLEF can return to KLEF after a semester or year. Based on courses done in the other institution, equivalent credits shall be awarded to such students.

Credit transfer from another institution to KLEF:

A student studying in another institution can take transfer to KLEF under the following conditions:

- When a student seeks transfer, equivalent credits will be assigned to the student based on the courses studied by the student.

- To determine the equivalent credits for a course from a previous institution on a 10-point scale at KLEF, the number of credits of the course is multiplied by the equivalent grade point of the previous institution and then divided by the number of credits of the corresponding course at KLEF.

- If a course from the previous institution has zero credits and no grade assigned, the student must sit for the final examination for the equivalent course at KLEF.

- A transfer student seeking improvement in any course can take the final examination at KLEF, where the grade received at KLEF becomes the final grade recorded on their grade sheets.

- The student, when transferred from other institutions, must stick to the rules and regulations of KLEF.

- To graduate from KLEF, a student must study at least half of the minimum duration prescribed for a program at KLEF.

Credit Transfer Through MOOCs:

- Undergraduate students can get credits for MOOCs courses recommended by KLEF up to a maximum of 20% of their minimum credits required for graduation. The discretion of allocation of MOOCs courses equivalent to the courses in the curriculum lies with the office of the Dean Academics.

- A student may also be permitted to obtain 20 credits through MOOCs in addition to the minimum credits required for graduation. These 20 credits can also be utilized to acquire a Minor degree or an Honors degree if the courses are pronounced equivalent to those specified for the respective degrees by the office of the Dean Academics. These additional credits through MOOCs if to be considered for CGPA/Minor/Honors degree must be approved by Dean Academics prior to enrollment in the respective MOOCs.

- Students acquiring additional credits for Honors/Minor degree must adhere to the rules governing the award of the respective degree, otherwise, a student applying for registering into additional credits through MOOCs must possess a minimum CGPA of 7.5 till that semester.

Semester Promotion policy

Promotion is only course-based. Semester-based promotion is not applicable for B.A. students.

Counselling procedure

KLEF is committed to fostering a supportive and nurturing environment for our students, addressing not only their academic needs but also their psychological well-being. To achieve this, KLEF is implementing a comprehensive Mentor-Mentee Scheme aimed at providing holistic support through academic, career, and psychological counselling. To achieve this, KLEF implement a comprehensive Mentor-Mentee Scheme and establish the Central Academic Counselling Board (CACB) in addressing academic, career and student-psychological issues.

The Mentor-Mentee Scheme aims to provide personalized guidance and support to students throughout their academic journey. Each student shall be assigned a mentor from the faculty, who will act as a guide, counselor, and advocate for the student's academic and personal growth. The mentor-mentee relationship is intended to facilitate communication, goal-setting, and problem-solving.

The primary objectives of the Mentor-Mentee Scheme are:

- To facilitate a strong and positive mentor-mentee relationship that supports students' academic growth, personal development, and psychological well-being.

- To offer career counselling, guiding mentees in exploring career options, developing professional skills, and making informed career-related decisions.

- To provide psychological counselling, offering a safe space for mentees to discuss psychological concerns and providing appropriate support or referrals when needed.

- To provide tailored academic counselling, helping mentees set academic goals, plan their course of study, and navigate academic challenges effectively.

Academic Counselling:
The mentors oversee the following academic counselling activities which are not limited to:

- Providing guidance during academic registration sessions
- Monitoring attendance and addressing attendance-related concerns
- Communicating attendance and marks information to parents/guardians
- Addressing concerns related to backlogs and providing advice
- Advising on domain specializations and academic flexibilities
- Assisting students in exploring study abroad opportunities
- Conducting student and parent meetings to address academic concerns

Career Counselling:
The mentors oversee the following career counselling activities which are not limited to:

- Recommending technical skilling courses and certificate programs
- Facilitating internship opportunities and competitive exam preparations
- Guiding students through term papers, projects, hackathons, and coding challenges
- Providing information on higher education options and entrance exams
- Encouraging entrepreneurship awareness and guiding start-ups initiatives
- Assisting students in preparing for placements and future career goals
- Conducting student and parent meetings to discuss career aspirations

Psychological Counselling:
The Mentors oversee the following psychological counselling activities which are not limited to:

- Providing guidance on time management and classroom activities
- Addressing anti-ragging issues and promoting a positive attitude
- Providing support for managing mental stress and promoting well-being
- Addressing hostel, room, home, and food-related concerns
- Conducting student and parent meetings to address personal well-being

Mentor-Mentee allocation

- The Department Academic Counselling Board (DACB) is responsible for assigning approximately 20 students to each faculty member, who will act as their mentor. The mentors will guide and support their assigned students throughout their academic journey.
- Counsellors/mentors will be appointed from the students' respective parent departments, and these faculty members will continue as mentors until the students complete their course.
- The counselling program aims to help students develop their character, academic abilities, professional skills, and social responsibilities. Mentors play a vital role in this process by:
    - Maintaining detailed records of mentor-mentee interactions in the ERP system. Mentors are required to update the ERP with counselling remarks for both students and their parents every fortnight.
    - Providing regular updates to parents about students' academic progress, career developments, and physiological status through various communication channels, including phone calls, SMS, WhatsApp, and Telegram.
    - Ensuring that counselling remarks are accurately recorded in the ERP system, and reflecting these updates in DACB monthly reports and CACB semester reports.

Academic Counselling Board

- Academic Counselling Board is constituted by the Dean Academics. This board shall comprise of the Chairman, Convener, Principal/Director, HOD and Professor/Associate Professor. A student will be put under Academic Counselling Board in the following circumstances:
    - Has CGPA of less than 6.00.
    - Has F grade or Detained in multiple courses.
- The first level of Counselling such students will be done by the Mentor of the student and the HoD followed by the ACB and the list of students who have to undergo the ACB counselling be forwarded by the HoD to the Office of Dean Academics.
- The students undergoing the Academic Counselling Board process may be allowed to register only for a few courses based on the recommendation of Academic Counselling Board.

Rustication policy

A student may be rusticated from the KLEF on disciplinary grounds, based on the recommendations of any empowered committee, by the Vice Chancellor.

Malpractice penalty policy

The following actions constitute malpractice during examinations and are subject to disciplinary actions as outlined below:

Clause 1: Possession of unauthorized material in the examination hall (e.g., paper, notebooks, programmable calculators, cell phones, or any material related to the exam subject). This includes any marks on the candidate's body that could be used as an aid.

Penalty: Immediate expulsion from the examination hall, without cancelling the paper.

Clause 2: a) Providing or receiving assistance, or communicating with others via oral means, body language, or electronic devices (such as cell phones), either inside or outside the examination hall. b) Smuggling in or out answer sheets, additional sheets, or arranging to send out the question paper or answer sheets during or after the exam. c) Using objectionable or offensive language in the answer paper or in communication with examiners, or attempting to influence examiners to award passing marks. d) Exchanging answer scripts or additional sheets in the examination hall

Penalty: Expulsion from the examination hall and cancellation of the comprehensive examination performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him

Clause 3: Copying from any unauthorized material (e.g., paper, books, programmable calculators, palm computers) during the exam.

Penalty: Expulsion from the examination hall, cancellation of the exam performance in that subject, and a fine of Rs. 1000.

Clause 4: a) Taking the answer script outside the exam hall, tearing the script or any part of it inside or outside the hall. b) Appearing for the exam in a drunken condition.

Penalty: Expulsion from the examination hall and cancellation of comprehensive examination performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining comprehensive examinations of the subjects of that semester/year.

Clause 5: a) Disobeying examination authorities, creating disturbances, organizing or instigating a walk-out, threatening or assaulting officials, or damaging property inside or outside the exam hall. b) Possession of any lethal weapon or firearm in the examination hall.

Penalty: Expulsion from the exam hall and cancellation of exam performance in all subjects. The student will be debarred from future exams and may forfeit their seat. Outsiders will be handed over to the police.

Clause 6: Impersonation during the examination.

Penalty: Both the impersonator and the original candidate will be expelled from the exam hall. The original candidate's performance will be cancelled in all subjects, including practical and project work, and they will be barred from exams for two consecutive semesters. Continuation in the course is subject to academic regulations. The impersonator (if an outsider) will be handed over to the police.

Clause 7: Repeated offenses.

Penalty: For a second offense, the candidate will face expulsion from the exam hall and cancellation of all exam performances for that term, with a fine of Rs. 1000. Repeated academic dishonesty may result in the issuance of a transfer certificate (TC).

Clause 8: Any other form of malpractice not specified.

Penalty: Punishment will be determined by the Examination Malpractice Committee and approved by the Vice-Chancellor.

Plagiarism Penalty Policy

Plagiarism is considered a serious breach of academic integrity, compromising both the ethical standards of the university and the intellectual development of students. The university enforces a strict zero-tolerance policy regarding plagiarism, and all students are expected to uphold the highest standards of academic honesty.

Penalties for plagiarism will be applied as follows:

First Offense:

- Minor Plagiarism (e.g., improper citation, small portions of copied work): The student will receive a warning and be required to resubmit the work with proper citations. Marks may be reduced up to 50%.
- Major Plagiarism (e.g., copying significant portions, submitting another person's work): The assignment will receive a grade of zero. The student may be required to attend a mandatory workshop on academic integrity.

Second Offense:

- Any second offense, regardless of severity, will result in a zero for the assignment and an official letter of reprimand placed in the student's record. The student will be placed on academic probation.

Third Offense:

- The student will face suspension from the university for one academic term. A record of academic misconduct will be permanently placed in the student's academic file.

Repeated Violations:

- Further violations after the third offense may lead to expulsion from the university.

In cases of group work, if plagiarism is identified, all group members will be held equally accountable unless it can be demonstrated that the act of plagiarism was isolated to specific individuals.

Terminology

Absolute Grading: Absolute grading is a method of assigning grades based on predetermined criteria or standards rather than comparing student performance to other students in the class (See: Relative Grading where the performances are compared).

Academic Bank of Credits (ABC): Academic Bank of Credits, an initiative of Government of India, is a digital platform that stores the academic credits earned by a student throughout their educational journey. It's essentially a virtual repository of a student's academic achievements.

Academic Council: The Academic Council is the highest academic body of the University and is responsible for the maintenance of standards of instruction, education and examination within the University. The Academic Council is an authority as per UGC regulations and has the right to decide all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises of two consecutive regular semesters i.e., Odd and Even semesters.

Acceleration: Acceleration of courses refers to a student's ability to progress through their academic program at a faster pace than traditional timelines.

Attendance: Attendance refers to the record of a student's presence or absence in educational institutions. It is a critical factor influencing academic performance, overall development, and future success.

Audited Course: It is a course of study which has zero credits and has a "Satisfactory" or an "Unsatisfactory" grade.

Backlog Course: A course is considered to be a backlog if the student has obtained 'F' grade or detained in the course.

Basic Sciences: The courses of foundational nature in the areas of Mathematics, Physics, Chemistry, Biology etc., are offered in this category.

Betterment: Betterment is a way that contributes towards improving the students' grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

Board of Studies: Board of Studies (BOS) is an authority as defined in UGC regulations, constituted by Vice Chancellor for each of the department separately. They are responsible for curriculum design and update in respect of all the programs offered by a department.

Branch of Study: It is a branch of knowledge, an area of study or a specific program (like Civil Engineering, Mechanical Engineering, Electrical and Electronics Engineering etc.)

Bridge Courses: Courses which are required to bridge the continuity among the Basic sciences/Engineering Sciences/professional courses (both core and electives) and are identified through gap analysis carried out using feedback obtained from various academic stakeholders are termed as Bridge Courses. These courses also do not yield any credits but require a "Satisfactory" result to register into the attached professional courses.

Capstone Project: A capstone project is the culminating academic experience for many students, typically undertaken in the final year of a degree program. It's designed to integrate and apply the knowledge and skills acquired throughout the course of study.

Certificate course: It is a course that makes a student gain hands-on expertise and skills required for holistic development. It is a mandatory, non-credited course for the award of degree.

Change of Branch: Change of branch means transfer from one's branch of study to another.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Course: A course is a subject offered by the University for learning in a particular semester.

Course Handout: Course Handout is a document which gives a complete plan of the course. It contains the details of the course viz. Course title, Course code, Pre-requisite, Credit structure, team of instructors, Course objectives, Course rationale, Course Outcomes and the relevant syllabus, textbook(s) and reference books, Course delivery plan and session plan, evaluation method, chamber consultation hour, course notices and other course related aspects. In essence, course handout is an agreement between students (learners) and the instructor.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Course Withdrawal: Withdrawing from a Course means that a student can drop from a course within the first two weeks of the odd or even Semester (deadlines are different for summer sessions). However, s/he can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture hour per week or two hours per week of tutorials/ self-learning/ practical/ field work during a semester.

Credit point: It is the product of grade point and number of credits for a course.

Credit Transfer: The procedure of granting credit (s) to a student for course(s) undertaken at another institution.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum is a standards-based sequence of planned experiences where students practice and achieve proficiency in content and applied learning skills. Curriculum is the central guide for all educators as to what is essential for teaching and learning, so that every student has access to rigorous academic experiences.

Deceleration: Deceleration of courses typically refers to a student's decision to reduce their course load or extend the time taken to complete a degree program.

Degree: A student who fulfils all the Program requirements is eligible to receive a degree.

Degree Requirements: Degree requirements are the specific courses, credits, and academic standards that a student must fulfill to earn a particular degree.

Degree with Specialization: A student who fulfills all the Program requirements of her/his discipline and successfully completes a specified set of Professional elective courses in a specialized area is eligible to receive a degree with specialization.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources.

Designing Your Own Degree: Designing your own degree is a revolutionary concept that empowers students to create a customized educational path aligned with their passions, career goals, and unique learning styles.

Dissertation: Dissertation is a substantial piece of original research written and defended by a candidate for a degree.

Detention in a course: Student who does not obtain minimum prescribed marks in continuous in-semester evaluation and /or minimum prescribed attendance in a course shall be detained in that course.

Double Major Degree: A double major degree allows students to specialize in two academic fields while earning a single bachelor's degree.

Dropping from the Semester: A student who doesn't want to register for the semester should do so in writing in a prescribed format before commencement of the semester.

End-semester Evaluation: End-semester evaluation is a summative assessment conducted at the conclusion of an academic term to measure students' overall performance.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective, Open Elective, Management Elective and Humanities Elective.

Engineering Sciences: The courses belonging to basic evolutionary aspects of engineering from Mechanical Sciences, Electrical Sciences and Computing like Engineering Mechanics, Data structures, Network Theory, Signal Analysis.

EPICS: EPICS stands for Engineering Projects in Community Service. It's a unique program that combines engineering education with community service.

Evaluation: Evaluation is the process of judging the academic work done by the student in her/his courses. It is done through a combination of continuous in-semester assessment and semester end examinations.

Experiential Learning: Experiential learning is a process through which students develop knowledge, skills, and values from direct experiences outside a traditional academic setting. It involves learning by doing, where students engage in hands-on activities, real-world problem-solving, and reflective practices to gain deeper understanding and practical application of the concepts they are studying.

Flexi-Core course: A Flexi-Core course typically refers to an elective or optional course within a degree program that offers students flexibility in choosing subjects based on their interests and career goals.

Formative Assessment: Formative assessment is ongoing evaluation of student understanding to inform instruction and facilitate learning.

Flipped Learning: Flipped learning is an instructional strategy that reverses the traditional teaching model. In flipped learning, students are introduced to new content outside of class, usually through video lectures, readings, or other materials. The in-class time is then used for more interactive activities, such as discussions, problem-solving, group work, and applying the concepts learned at home.

Grade: It is an index of the performance of the students in a said course. Grades are denoted by alphabets.

Grade Point: It is a numerical weight allotted to each letter grade on a 10 - point scale.

Grade Point Average (GPA): Grade Point Average is a numerical representation of a student's academic performance. It is calculated by averaging the numerical equivalents of letter grades earned in courses, considering the number of credit hours for each course.

Honors Degree: A student who fulfills all the Program requirements of her/his discipline and successfully completes a specified set of additional courses within the same program is eligible to receive an Honors degree.

Humanities, Arts and Social Sciences (HAS): It is a broad term that groups together the academic disciplines of humanities, arts and social sciences.

Industrial Training: Training program undergone by the student as per the academic requirement in any company/firm.

Industrial Visit: Visit to a company/firm as per the academic requirement.

Internship: Internship is a temporary work experience offered by an organization for a limited period. It provides students, graduates, or career changers with an opportunity to gain practical skills and experience in a specific field.

In-Semester Evaluation: Summative assessments used to evaluate student learning, acquired skills, and academic attainment during a course.

Induction Courses: Student who gets admitted into program must complete a set of Induction courses for a minimum period of 3 weeks and obtain a "Satisfactory" result prior to registering into 1st Semester of the Program.

Innovation Semester: An Innovation Semester is a dedicated academic term focused on cultivating a culture of creativity, problem-solving, and entrepreneurial thinking.

Lecture: A lecture is a formal instructional session where an instructor presents information to a large group of students.

Make-up Test: An additional test scheduled on a date other than the originally scheduled date.

Malpractice: Malpractice typically refers to academic dishonesty or misconduct during examinations or coursework. This can include a wide range of behaviors that compromise the integrity of the evaluation process.

Management elective: A course that develops managerial skills and inculcates entrepreneurial skills.

Minor Degree: A student who fulfills all the Program requirements of her/his discipline and successfully completes a specified set of courses from another discipline is eligible to receive a minor degree in that discipline.

Multiple Entry and Multiple Exit (MEME): It is an educational framework designed to provide flexibility in learning pathways, allowing students to enter and exit educational programs at various stages based on their individual needs, prior knowledge, and career goals.

National Education Policy (NEP): NEP 2020 is a comprehensive framework for transforming India's Education System. It aims to create an equitable and vibrant knowledge society by providing high-quality education to all.

NHEQF: NHEQF stands for National Higher Education Qualifications Framework. It's a comprehensive framework designed to standardize and classify higher education qualifications in India. The primary goal of NHEQF is to ensure that qualifications from different institutions are comparable and recognized nationally and internationally.

Open Elective: This is a course of interdisciplinary nature. It is offered across the University for all Programs.

Overloading: Registering for more number of credits than normally prescribed by the Program in a semester.

Peer Learning: Peer learning is a collaborative learning process where students learn from each other. It involves sharing knowledge, skills, and experiences among peers.

Practical: A practical is a hands-on session where students apply theoretical knowledge in a real-world or laboratory setting. Practical sessions are designed to develop students' technical skills, problem-solving abilities, and understanding of experimental procedures.

Practice School: It is a part of the total program and takes one full semester in a professional location, where the students and the faculty get involved in finding solutions to real-world problems. A student can choose Project/Practice School during his/her final year to meet the final requirements for the award of degree.

Pre-requisite: A course, the knowledge required for registration into higher level course.

Product Development Semester: A Product Development Semester is an academic term dedicated to the process of creating new products or improving existing ones.

Professional Core: The courses that are essential constituents of each engineering discipline are categorized as Professional Core courses for that discipline.

Professional Elective: A course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: A set of courses offered by the Department. A student can opt and complete the stipulated minimum credits to qualify for the award of a degree in that Program.

Program Educational Objectives: The broad career, professional, personal goals that every student will achieve through a strategic and sequential action plan.

Program Outcome (PO): Program outcomes are statements that describe what students are expected to know, understand, and be able to do upon completing a specific academic program.

Project: Course that a student must undergo during his/her final year which involves the student to undertake a research or design, which is carefully planned to achieve a particular aim. It is a credit-based course.

Project-Based Learning (PBL): Project-Based Learning is an instructional approach where students actively engage in real-world and personally meaningful projects.

Rapid Prototyping Semester: A Rapid Prototyping Semester is an academic term dedicated to the practical application of rapid prototyping techniques to create physical models or prototypes of products or designs.

Registration: Process of enrolling into a set of courses in a semester/ term of the Program.

Re-Registration: Student who are detained in courses due to attendance or marks criteria as per their regulation are given a chance to re-register for the same and complete it during the summer term.

Relative Grading: Relative grading is a method of assigning grades based on a student's performance compared to the rest of the class.

Remedial Exam: A remedial Exam is an assessment designed to identify specific areas of weakness or gaps in a student's knowledge or skills. It is typically administered after a student has performed poorly on a regular assessment.

Research Project: A research project is a systematic investigation undertaken to answer a specific question or address a particular problem.

Research Semester: A research semester is a dedicated period within an academic program focused on independent research or scholarly inquiry.

Research Seminar: A research seminar is a formal academic gathering where researchers present their ongoing work to a group of peers, faculty, and other interested individuals.

Self-learning: Self-learning is the process of acquiring knowledge and skills independently without formal instruction.

Semester: It is a period of study consisting of 15+1 weeks of academic work equivalent to normally 90 working days including examination and preparation holidays. The odd Semester starts normally in July and even semester in December.

Semester End Examinations: It is an examination conducted at the end of a course of study.

Skilling: It is a process of developing and enhancing specific skills that are essential for performing particular tasks or activities effectively. It involves structured training and practice aimed at equipping individuals with the practical abilities, knowledge, and competencies required for professional success and personal development.

Social Immersive Learning (SIL): Social Immersive Learning is a pedagogical approach that combines the power of social interaction with immersive technologies to create engaging and impactful learning experiences.

Social Service: An activity designed to promote social awareness and generate well-being; to improve the life and living conditions of society.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

Substitution of Elective course: Replacing an elective course with another elective course as opted by the student.

Summative Assessment: Summative Assessment is a type of evaluation that occurs at the end of a learning period.

Summer term: The term during which courses are offered from May to July. Summer term is not a student's right and will be offered at the discretion of the University.

Supplementary: A student can reappear only in the semester end examination for the Theory component of a course, subject to the regulations contained herein.

Term paper: A 'term paper' is a research report written by students that evolves their course-based knowledge, accounting for a grade. Term paper is a written original research work discussing a topic in detail. It is a credit-based course.

Tutorial: A tutorial is a small group session designed to provide personalized guidance and support to students. Tutorials often involve discussions, problem-solving activities, and hands-on practice to reinforce concepts learned in lectures.

Under-loading: Registering for lesser number of credits than normally prescribed for a semester in that Program.

Value-Added Courses: Courses leading to global certification and those which are conducted exclusively for employability are referred to as value added courses.

FAQs

Q:What is the Choice-Based Credit System (CBCS) and how does it work?
A: CBCS allows student to choose courses from various categories based on your interests and career goals. Each course has a credit value assigned to it, and you need to earn a minimum number of credits in each category and in total to complete your program.

Q: Can I choose electives based on my interests?
A: Yes, student has the flexibility to choose electives that align with your personal interests and career objectives.

Q: Can I choose my preferred faculty members for certain courses?
A: During registrations prior to commencement of each semester, if a course is offered for multiple sections and if multiple faculty are teaching the same course, you will then have a choice of selecting the section being taught by that faculty under whom you wish to study.

Q: When and how do I register for courses?
A: Student must register for courses on the designated registration day. There is a one-week window for adding courses and a two-week window for dropping or changing them.

Q: Can I get an attendance waiver?
A: Students with a CGPA and SGPA of 9.00 or higher in the previous semester can get an attendance waiver for up to three courses with prior approval.

Q: What is the minimum attendance requirement for promotion?
A: 85% attendance is required for course promotion and appearing for the semester-end exam.

Q: Can I pursue a minor degree?

A: Yes, any student can pursue a minor degree by completing a specified set of courses from another discipline.

Q: Can I study some semesters in abroad?
A: KLEF University may have exchange programs or partnerships with foreign universities, allowing you to study abroad for a semester or year.

Q: Are there any extracurricular activities or clubs available?
A: Yes, KLEF offers various extracurricular activities and clubs, such as sports, cultural events, and student organizations.

Q: What happens if I have less than 85% attendance?
A: Upto 75% attendance, student may be eligible for condonation or marginal case consideration, but need to provide proper documentation and may be subject to fees. But falling below 75% will make you detain in the course.

Q: What happens if I detain a course?
A: Student who detained in a course must re-register for the course and study it again in summer term. If the detained course is not offered by the department, then the student can study other equivalent course from the same category upon taking approval from office of Dean Academics.

Q: What is ABC?
A: ABC enables you to digitally store your earned credits and potentially use them towards future studies at other institutions.

Q: Can I accelerate or decelerate my studies?
A: Students are generally recommended to register for 20 to 24 credits in each semester. Students who cannot cope up with such load, may consult their counsellor and Head of the Department to register in lower number of credits. This process is called "Deceleration". Students who do not register on time, may also be forced to decelerate to compensate the classwork that they missed due to late registration. In both the cases of deceleration, permission must be sought from Office of Dean Academics through proper channel. On the contrary, Students who wish to accelerate can register for upto 30 credits by selecting courses that are usually offered in later semesters and complete them in advance. Students may also use the optional Summer Term for accelerating courses upto 12 credits. In Similarly, a student may also register for credits lower than. However, you'll need approval from the Dean of Academics.

Q: Will I get my degree upon acquiring all the required credits?
A: Apart from fulfilling the total credit requirement, it is required to fulfill category and sub-category wise credit requirements and outcome requirements (which are clearly mentioned in the degree-wise credit requirements section) to be eligible for award of specific degree.

Q: Can I register for a course without promoting in its pre-requisite course?
A: No, student must promote in the pre-requisite course in order to register for a course having pre-requisite.

Program - Degrees(Design your own Degree)

S#	Major Flexibility	Program Addon
1	No Flexibility	Minor
2	No Flexibility	Double Major
3	No Flexibility	Specialization
4	No Flexibility	No Add-on

Degree-wise Credit Requirements

1. No Flexibility with Minor

a) Credit Requirement **Total Credit Required: 142**

S#	Category	Sub-Category	Min-Credit	Max-Credit	Min-Courses	Max-Courses	Grouping
1	HAS	HAS-CORE	16	16	6	6	
2	BSC	BSC-CORE	7	7	2	2	
3	PCC	PCC-CORE	72	72	18	18	
4	SDC	SDC-CORE	8	8	4	4	
5	PEC	PE-1	3	3	1	1	
6	PEC	PE-2	3	9	1	3	
7	PRI	PRI-CORE	2	2	1	1	
8	OEC	OE-1	4	4	1	1	
9	OEC	OE-2	4	4	1	1	
10	VAC	VAC-CERT	0	0	2	2	
11	AUC	AUC-CORE	0	0	2	2	
12	AUC	AUC-CAREER	0	0	1	1	
13	SIL	SIL-CORE	3	3	3	3	
14	MIN	MIN-CORE	16	16	4	4	MINOR
15	MSDC	MIN-SDP	4	4	1	1	MINOR

b) Outcome Requirement

- Minimum CGPA 6.75.
- All MIN & MSDC Credits (16 + 4) must be from selected MINOR Degree.
- Must have finished all the above-mentioned requirements in less than twice the period of the program, which includes deceleration period chosen by the student, deceleration imposed by KLEF or debarred from the KLEF.

2. No Flexibility with Double Major

a) Credit Requirement **Total Credit Required: 154**

S#	Category	Sub-Category	Min-Credit	Max-Credit	Min-Courses	Max-Courses	Grouping
1	HAS	HAS-CORE	16	16	6	6	
2	BSC	BSC-CORE	7	7	2	2	
3	PCC	PCC-CORE	72	72	18	18	
4	SDC	SDC-CORE	8	8	4	4	
5	PEC	PE-1	3	3	1	1	
6	PEC	PE-2	3	3	1	1	
7	PRI	PRI-CORE	2	2	1	1	
8	OEC	OE-1	4	4	1	1	DOUBLE MAJOR
9	OEC	OE-2	4	4	1	1	DOUBLE MAJOR
10	VAC	VAC-CERT	0	0	2	2	
11	AUC	AUC-CORE	0	0	3	3	
12	AUC	AUC-CAREER	0	0	1	1	
13	SIL	SIL-CORE	3	3	3	3	
14	SMFC	SMFC-CORE	28	28	9	12	DOUBLE MAJOR
15	SMFC	SMFC-SDP	4	4	1	1	DOUBLE MAJOR

b) Outcome Requirement

- Minimum CGPA 7.75.
- All 40 Credits (SMFC+OEC) must be from selected Second Major Degree.
- Must have finished all the above-mentioned requirements in less than twice the period of the program, which includes deceleration period chosen by the student, deceleration imposed by KLEF or debarred from the KLEF.

3. No Flexibility with Specialization

a) Credit Requirement **Total Credit Required: 127**

S#	Category	Sub-Category	Min-Credit	Max-Credit	Min-Courses	Max-Courses	Grouping
1	HAS	HAS-CORE	16	16	6	6	
2	BSC	BSC-CORE	7	7	2	2	
3	PCC	PCC-CORE	72	72	18	18	
4	SDC	SDC-CORE	8	8	4	4	
5	SDC	SDP-1	2	2	1	1	SPECIALIZATION
6	PEC	PE-1	3	3	1	1	
7	PEC	PE-2	3	3	1	1	
8	PEC	PE-3	3	4	1	1	SPECIALIZATION
9	PRI	PRI-CORE	2	2	1	1	
10	OEC	OE-1	4	4	1	1	
11	OEC	OE-2	4	4	1	1	
12	VAC	VAC-CERT	0	0	2	2	
13	AUC	AUC-CORE	0	0	2	2	
14	AUC	AUC-CAREER	0	0	1	1	
15	SIL	SIL-CORE	3	3	3	3	

b) Outcome Requirement

- Minimum CGPA 6.75.
- All PEC and SDP-1 Credits must be from selected specialization.
- Must have finished all the above-mentioned requirements in less than twice the period of the program, which includes deceleration period chosen by the student, deceleration imposed by KLEF or debarred from the KLEF.

4. No Flexibility with No Add-on

a) Credit Requirement **Total Credit Required: 122**

S#	Category	Sub-Category	Min-Credit	Max-Credit	Min-Courses	Max-Courses	Grouping
1	HAS	HAS-CORE	16	16	6	6	
2	BSC	BSC-CORE	7	7	2	2	
3	PCC	PCC-CORE	72	72	18	18	
4	SDC	SDC-CORE	8	8	4	4	
5	PEC	PE-1	3	3	1	1	
6	PEC	PE-2	3	3	1	1	
7	PRI	PRI-CORE	2	2	1	1	
8	OEC	OE-1	4	4	1	1	
9	OEC	OE-2	4	4	1	1	
10	VAC	VAC-CERT	0	0	2	2	
11	AUC	AUC-CORE	0	0	2	2	
12	AUC	AUC-CAREER	0	0	1	1	
13	SIL	SIL-CORE	3	3	3	3	

b) Outcome Requirement

- Minimum CGPA 5.25.
- Must have finished all the above-mentioned requirements in less than twice the period of the program, which includes deceleration period chosen by the student, deceleration imposed by KLEF or debarred from the KLEF.

Program Structure

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	HAS	HAS-CORE	23UC0026	HUMAN VALUES, GENDER EQUALITY & PROFESSIONAL ETHICS	R	HGP	2	0	0	0	2	2	
2	HAS	HAS-CORE	24GN2201	INTERNAL SECURITY	R	IS	3	0	0	0	3	3	
3	HAS	HAS-CORE	24GN3201	DISASTER MANAGEMENT	R	DM	2	0	0	0	2	2	
4	HAS	HAS-CORE	24UC1103	LANGUAGE SKILLS	R	LS	0	0	4	0	2	4	
5	HAS	HAS-CORE	24UC1203	DESIGN THINKING AND INNOVATION	R	DTI	2	0	2	0	3	4	
6	HAS	HAS-CORE	24UC2105	COMMUNICATION SKILLS	R	CS	0	0	4	0	2	4	
7	HAS	HAS-CORE	23UC0027	LEADERSHIP AND MANAGEMENT SKILLS	R	LAMS	0	0	4	0	2	4	
8	BSC	BSC-CORE	24BA2107	SCIENCE AND TECHNOLOGY	R	ST	2	1	0	0	3	3	
9	BSC	BSC-CORE	24BA1101	QUANTITATIVE METHODS IN ECONOMICS	R	QME	2	1	0	4	4	7	
10	PCC	PCC-CORE	24BA1102	INTRODUCTION TO MICRO ECONOMICS	R	IME	2	1	0	4	4	7	
11	PCC	PCC-CORE	24BA1103	POLITICAL THEORY AND THOUGHT	R	PTT	2	1	0	4	4	7	
12	PCC	PCC-CORE	24BA2213R	PUBLIC FINANCE	R	PF	2	1	0	4	4	7	MBK(1) Rule:1
13	PCC	PCC-CORE	24BA2214R	HEALTH & ENVIRONMENTAL ECONOMICS	R	HEC	2	1	0	4	4	7	
14	PCC	PCC-CORE	24BA2215	INTERNATIONAL RELATIONS: THEORIES AND CONCEPTS	R	IR	2	1	0	4	4	7	
15	PCC	PCC-CORE	24BA2216R	INTERNATIONAL ORGANISATIONS AND INVESTMENT MODEL	R	IOIM	2	1	0	4	4	7	
16	PCC	PCC-CORE	24BA3119R	ECONOMICS OF GROWTH AND DEVELOPMENT	R	EGD	2	1	0	4	4	7	
17	PCC	PCC-CORE	24BA3120R	INDIAN ECONOMIC PROBLEMS AND POLICIES	R	IEPP	2	1	0	4	4	7	
18	PCC	PCC-CORE	24BA3121	DIGITAL LABOR MARKETS	R	DLM	2	1	0	4	4	7	
19	PCC	PCC-CORE	24BA3122R	INDIAN FOREIGN POLICY	R	IFP	2	1	0	4	4	7	
20	PCC	PCC-CORE	24BA3223R	CONTEMPORARY ISSUES IN INDIAN ECONOMY	R	CIIE	2	1	0	4	4	7	
21	PCC	PCC-CORE	24BA3224	COMPUTER APPLICATIONS IN ECONOMICS	R	CAE	2	1	0	4	4	7	
22	PCC	PCC-CORE	24BA3225	LOCAL GOVERNANCE	R	LG	2	1	0	4	4	7	
23	PCC	PCC-CORE	24BA3226	POLITICAL DYNAMICS AND WORKING OF INDIAN CONSTITUTION	R	PDWIC	2	1	0	4	4	7	
24	PCC	PCC-CORE	24BA2108R	BASICS OF ECONOMETRICS	R	BE	2	1	0	4	4	7	QME(1) Rule:1

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
25	PCC	PCC-CORE	24BA2109R	AGRICULTURAL ECONOMICS	R	AE	2	1	0	4	4	7	
26	PCC	PCC-CORE	24BA2110R	COMPARATIVE POLITICS	R	CP	2	1	0	4	4	7	
27	PCC	PCC-CORE	24BA1204	FUNDAMENTALS OF MACRO-ECONOMICS	R	FME	2	1	0	4	4	7	
28	PCC	PCC-CORE	24BA1205	MONEY AND BANKING	R	MBK	2	1	0	4	4	7	
29	PCC	PCC-CORE	24BA1206	INDIAN GOVERNMENT AND POLITICS	R	IGP	2	1	0	4	4	7	
30	SDC	SDC-CORE	24SDBA01	INTRODUCTION TO GEOGRAPHY	R	IG	0	0	2	4	2	6	
31	SDC	SDC-CORE	24SDBA02	PHYSICAL GEOGRAPHY	R	PG	0	0	2	4	2	6	
32	SDC	SDC-CORE	24SDBA03	GEOGRAPHY OF INDIA	R	GI	0	0	2	4	2	6	
33	SDC	SDC-CORE	23SDBA04	SOCIAL GEOGRAPHY AND CARTOGRAPHY	R	SGC	0	0	2	4	2	6	
34	SDC	SDP-1	24SDBA05	ECONOMIC GEOGRAPHY	R	EG	0	0	2	4	2	6	
35	PEC	PE-1	24BA11H1	MODERN INDIAN LANGUAGE- HINDI-1	R	MILH1	3	0	0	0	3	3	
36	PEC	PE-1	24BA11T1	MODERN INDIAN LANGUAGE - TELUGU-1	R	MILT1	3	0	0	0	3	3	
37	PEC	PE-2	24BA12H2	MODERN INDIAN LANGUAGE- HINDI-2	R	MILH2	3	0	0	0	3	3	
38	PEC	PE-2	24BA12T2	MODERN INDIAN LANGUAGE - TELUGU-2	R	MILT2	3	0	0	0	3	3	
39	PEC	PE-3	24BA2111R	INTERNATIONAL ECONOMICS AND FINANCE	R	IEF	2	1	0	4	4	7	
40	PEC	PE-3	24BA2112R	INDUSTRIAL ECONOMICS	R	IE	2	1	0	4	4	7	
41	PEC	PE-3	24BA3227	ECONOMICS AND DATA ANALYTICS	R	EDA	2	1	0	4	4	7	
42	PRI	PRI-CORE	24IE1201	SUMMER INTERNSHIP PROGRAM -1	R	SIP-1	0	0	0	8	2	8	
43	OEC	OE-1	24OEAR01	ARCHITECTURAL JOURNALISM	R	AJ	3	0	0	0	3	3	
44	OEC	OE-1	24OECA01	FUNDAMENTALS OF DATA ANALYTICS	R	FDA	4	0	0	0	4	4	
45	OEC	OE-1	24CA2108R	COMPUTER NETWORKS	R	CN	3	1	0	0	4	4	
46	OEC	OE-1	24OEVC01M	GRAPHIC DESIGN	M	GDN	4	0	0	0	4	4	
47	OEC	OE-1	24BB1206R	MARKETING MANAGEMENT	R	MM	3	0	2	0	4	5	
48	OEC	OE-1	23ACCABT	BUSINESS TECHNOLOGY	R	BT	4	0	0	0	4	4	
49	OEC	OE-1	22FT2212R	PROCESSING OF AQUATIC FOODS	R	PAF	3	0	2	0	4	5	
50	OEC	OE-1	24OEBB01	ESSENTIALS OF FINANCE	R	EOF	4	0	0	0	4	4	
51	OEC	OE-1	24AG1104	GRAPHIC DESIGN	R	GDS	2	0	4	0	4	6	

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52	OEC	OE-1	23OEEE03	ELECTRICAL POWER ENGINEERING	R	EPE	4	0	0	0	4	4	
53	OEC	OE-1	23EC2211R	VLSI DESIGN	R	VLSID	3	0	2	2	4.5	7	
54	OEC	OE-1	23BT2209R	BIOCHEMICAL REACTION ENGINEERING	R	BCRE	3	0	2	0	4	5	
55	OEC	OE-1	23AD2204R	DATA MANAGEMENT AND WAREHOUSING	R	DMW	3	0	2	0	4	5	
56	OEC	OE-1	23IN2102	ELECTRONIC DEVICES AND INTEGRATED CIRCUITS	R	EDAIC	3	0	2	0	4	5	
57	OEC	OE-1	23ME2106R	MECHANICS OF SOLIDS	R	MOS	3	0	2	0	4	5	
58	OEC	OE-1	23CE2208R	GEOTECHNICAL ENGINEERING	R	GTE	3	0	2	0	4	5	
59	OEC	OE-2	23CE2209R	TRANSPORTATION ENGINEERING	R	TPE	3	0	2	0	4	5	
60	OEC	OE-2	23ME2116	FLUID MECHANICS & HYDRAULIC MACHINES	R	FMHM	3	0	2	0	4	5	
61	OEC	OE-2	23AD3106R	BIG DATA ENGINEERING	R	BDE	3	0	2	0	4	5	
62	OEC	OE-2	23EC2208R	DIGITAL COMMUNICATION	R	DC	3	0	2	0	4	5	
63	OEC	OE-2	23IN2203	WIRELESS TECHNOLOGIES FOR IOT	R	WTIOT	3	0	2	0	4	5	
64	OEC	OE-2	23BT3212	PLANT AND ANIMAL BIOTECHNOLOGY	R	PABT	3	0	2	0	4	5	
65	OEC	OE-2	24AG2108A	ADVERTISING AND PUBLIC RELATIONS	A	APR	4	0	0	0	4	4	
66	OEC	OE-2	24OEBB02	ESSENTIALS OF MARKETING	R	EOM	4	0	0	0	4	4	
67	OEC	OE-2	22FT22C1R	FOOD ANALYSIS AND QUALITY ASSURANCE	R	FAQA	3	0	2	0	4	5	
68	OEC	OE-2	24BB2107R	FOUNDATIONS OF FINANCIAL MANAGEMENT	R	FM	3	0	2	0	4	5	
69	OEC	OE-2	24OEVC02	PHOTOGRAPHY BASICS	R	PGB	4	0	0	0	4	4	
70	OEC	OE-2	24CA2210	SOFTWARE ENGINEERING	R	SE	3	1	0	0	4	4	
71	OEC	OE-2	24OECA02	ESSENTIALS OF SOFTWARE DEVELOPMENT	R	ESD	4	0	0	0	4	4	
72	OEC	OE-2	23ACCAFA	FINANCIAL ACCOUNTING	R	FA	3	2	0	0	5	5	
73	OEC	OE-2	24OEBB03	ESSENTIALS OF HUMAN RESOURCES	R	EOHR	4	0	0	0	4	4	
74	VAC	VAC-CERT	23CC3127	CAMBRIDGE LINGUASKILL CERTIFICATION	R	CLSC	0	0	0	8	0	8	
75	VAC	VAC-CERT	24CC4006	PROGRAMMING USING PYTHON	R	P P	0	0	0	8	0	8	
76	VAC	VAC-CERT	24CC4005	SQL FOR DATA ANALYTICS	R	SQL	0	0	0	8	0	8	
77	AUC	AUC-CORE	24AUBA02	SOCIAL SCIENCE RESEARCH	R	SSR	4	0	0	0	4	4	
78	AUC	AUC-CORE	23UC0009	ECOLOGY AND ENVIRONMENT	R	E&E	2	0	0	0	0	2	

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79	AUC	AUC-CAREER	CRTVQRL1V1	CAMPUS RECRUITMENT: VERBAL APTITUDE TRAINING	R	CRT: VAT	0	0	0	8	0	8	
80	AUC	AUC-CAREER	CRTVQRL2V2	CAMPUS RECRUITMENT: QUANTITATIVE APTITUDE TRAINING	R	CRT: QAT	0	0	0	8	0	8	
81	AUC	AUC-CAREER	CRTVQRL3V3	CAMPUS RECRUITMENT: REASONING APTITUDE TRAINING	R	CRT: RAT	0	0	0	8	0	8	
82	AUC	AUC-CAREER	CRTCSSL1V1	CAMPUS RECRUITMENT: COMMUNICATION SKILLS TRAINING	R	CRT: CST	0	0	0	8	0	8	
83	AUC	AUC-CAREER	CRTCSSL2V2	CAMPUS RECRUITMENT: SOFT SKILLS TRAINING	R	CRT: SST	0	0	0	8	0	8	
84	AUC	AUC-CAREER	CADCORL1V1	CAREER ADVANCEMENT: TRAINING IN CORE DOMAIN	R	CAD: TICD	0	0	0	8	0	8	
85	AUC	AUC-CAREER	CADUPSL1V1	CAREER ADVANCEMENT: UPSC-CIVIL SERVICES EXAM TRAINING	R	CAD: UPSC	0	0	0	8	0	8	
86	AUC	AUC-CAREER	CADUPSL2V2	CAREER ADVANCEMENT: UPSC-CIVIL SERVICES EXAM TRAINING	R	CAD: UPSC	0	0	0	8	0	8	
87	AUC	AUC-CAREER	CADENTL1V1	CAREER ADVANCEMENT:ENTREPRENEURIAL CAREER PATHWAY TRAINING	R	CAD: ECPT	0	0	0	8	0	8	
88	AUC	AUC-CAREER	CRTCODL1V1	CAMPUS RECRUITMENT: LOGIC BUILDING SKILLS TRAINING	R	CRT: LBST	0	0	0	8	0	8	
89	AUC	AUC-CAREER	CADCOML1V1	CAREER ADVANCEMENT:COMPETITIVE EXAM TRAINING	R	CAD: COM	0	0	0	8	0	8	
90	SIL	SIL-CORE	22UC0021	SOCIAL IMMERSIVE LEARNING	R	SIL-1	0	0	0	4	1	4	
91	SIL	SIL-CORE	22UC0022	SOCIAL IMMERSIVE LEARNING	R	SIL-2	0	0	0	4	1	4	
92	SIL	SIL-CORE	22UC0023	SOCIAL IMMERSIVE LEARNING	R	SIL-3	0	0	0	4	1	4	
93	MIN	MIN-CORE	23GET3101R	SOLAR PV AND MICRO ENERGY TECHNOLOGIES	R	SPMET	3	0	2	4	5	9	
94	MIN	MIN-CORE	23GET3202R	WIND AND ENERGY STORAGE TECHNOLOGIES	R	WEST	3	0	0	0	3	3	
95	MIN	MIN-CORE	23GET3405M	ENERGY MANAGEMENT AND GREEN BUILDING	M	EMGB	3	0	0	0	3	3	
96	MIN	MIN-CORE	23SGT3101R	DISTRIBUTED ENERGY RESOURCES AND SMART GRIDS	R	DERSG	3	0	2	4	5	9	
97	MIN	MIN-CORE	23SGT3406M	SMART METERS AND SMART CITIES	M	SMSC	3	0	0	0	3	3	
98	MIN	MIN-CORE	23SGT3507	INTERNET OF THINGS AND SMART GRID ANALYTICS	R	IOT&SGA	3	0	0	0	3	3	
99	MIN	MIN-CORE	23CE2208A	GEOTECHNICAL ENGINEERING	A	GTE	4	0	4	0	6	8	
100	MIN	MIN-CORE	23EE2226F	ELECTRICAL TECHNOLOGY	F	ET	2	0	2	0	3	4	
101	MIN	MIN-CORE	23EC1202	DIGITAL DESIGN & COMPUTER ARCHITECTURE	R	DDCA	3	0	2	0	4	5	

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102	MIN	MIN-CORE	23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	R	BEEC	2	0	0	0	2	2	
103	MIN	MIN-CORE	23EE2207R	CONTROL SYSTEMS	R	CS	3	0	2	0	4	5	
104	MIN	MIN-CORE	23CI2001	ADAPTIVE SOFTWARE ENGINEERING	R	ASE	3	1	0	0	4	4	
105	MIN	MIN-CORE	23EC2223F	FUNDAMENTALS OF ROBOTICS	F	FOR	2	0	2	0	3	4	
106	MIN	MIN-CORE	23SMF3405M	ROBOTICS & INDUSTRIAL AUTOMATION	M	RIA	3	0	0	0	3	3	
107	MIN	MIN-CORE	23SMF3507	MACHINE TO MACHINE COMMUNICATION	R	MMC	3	0	0	0	3	3	
108	MIN	MIN-CORE	23CE2103R	SURVEYING	R	SVY	3	0	2	4	5	9	
109	MIN	MIN-CORE	23CE2105R	SOLID MECHANICS	R	SMN	3	0	2	0	4	5	
110	MIN	MIN-CORE	23CE2206	STRUCTURAL ANALYSIS	R	STA	3	1	0	0	4	4	
111	MIN	MIN-CORE	23CSB3101R	CRYPT ANALYSIS & CYBER DEFENSE	R	CACD	3	0	2	4	5	9	
112	MIN	MIN-CORE	23CSB3202R	NETWORK AND INFRASTRUCTURE SECURITY	R	NIS	3	0	0	0	3	3	
113	MIN	MIN-CORE	23CSB3203R	INTRODUCTION TO BLOCKCHAIN AND CRYPTO CURRENCIES	R	IBCC	2	0	2	0	3	4	
114	MIN	MIN-CORE	23CSB3304R	DIGITAL FORENSICS	R	DF	3	0	2	4	5	9	
115	MIN	MIN-CORE	23CSB3405M	DATABASE SYSTEM AND SECURITY	M	DSS	3	0	0	0	3	3	
116	MIN	MIN-CORE	23CSB3406M	PROGRAMMING FOR SMART CONTRACTS	M	PSC	3	0	0	0	3	3	
117	MIN	MIN-CORE	23CSB3510	SECURITY GOVERNANCE & MANAGEMENT	R	SGM	3	0	0	0	3	3	
118	MIN	MIN-CORE	23CS2104R	OPERATING SYSTEMS	R	OS	3	0	2	0	4	5	
119	MIN	MIN-CORE	23CS2205R	DESIGN AND ANALYSIS OF ALGORITHMS	R	DAA	3	0	2	4	5	9	
120	MIN	MIN-CORE	23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	R	CTSD	3	0	2	4	5	9	
121	MIN	MIN-CORE	24SC1203	DATA STRUCTURES	R	DS	3	0	2	4	5	9	
122	MIN	MIN-CORE	23CCF3101R	TCP/IP & OTHER PROTOCOL SUITE	R	TCP	3	0	2	4	5	9	
123	MIN	MIN-CORE	23EC2210R	NETWORK PROTOCOLS AND SECURITY	R	NPS	3	0	2	0	4	5	
124	MIN	MIN-CORE	23CE2229F	ADVANCED CONSTRUCTION TECHNOLOGY	F	ACT	3	0	0	0	3	3	
125	MIN	MIN-CORE	23CE4114	CONSTRUCTION PROJECT MANAGEMENT	R	CPM	3	0	0	0	3	3	
126	MIN	MIN-CORE	23EC2105R	SIGNALS & COMMUNICATION SYSTEMS	R	SCS	3	0	2	0	4	5	
127	MIN	MIN-CORE	23AD2102R	DATABASE MANAGEMENT SYSTEMS	R	DBMS	3	0	2	0	4	5	

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128	MIN	MIN-CORE	23EC2106R	PROCESSORS AND CONTROLLERS	R	PRC	3	0	2	0	4	5	
129	MIN	MIN-CORE	23ME2222F	INDUSTRIAL INTERNET OF THINGS	F	IIOT	2	0	2	0	3	4	
130	MIN	MIN-CORE	23EC2224F	DEEP NETWORK ARCHITECTURES	F	DNA	2	0	2	0	3	4	
131	MIN	MIN-CORE	23EC3112R	DISCRETE TIME SIGNAL PROCESSING	R	DTSP	3	0	2	0	4	5	
132	MIN	MIN-CORE	23IMP3101R	NATURAL LANGUAGE PROCESSING & APPLICATIONS	R	NLPA	3	0	2	4	5	9	
133	MIN	MIN-CORE	23MT2007	RANDOM VARIABLES AND STOCHASTIC PROCESS	R	RVASP	2	2	0	0	4	4	
134	MIN	MIN-CORE	23ME1001R	ENGINEERING MECHANICS	R	EM	3	0	0	0	3	3	
135	MIN	MIN-CORE	23GDU3101R	PROGRAMMING FOR GAME DEVELOPMENT	R	PGD	3	0	2	4	5	9	
136	MIN	MIN-CORE	23GDU3303R	AR & VR APPLICATION DEVELOPMENT	R	AR&VR	3	0	2	4	5	9	
137	MIN	MIN-CORE	23GDU3506	PRINCIPLES OF GAME DESIGN	R	PRGD	3	0	0	0	3	3	
138	MIN	MIN-CORE	24SC2105R	COMPUTATIONAL THINKING FOR OBJECT-ORIENTED DESIGN	R	CTOD	3	0	2	4	5	9	
139	MIN	MIN-CORE	23EC2235F	RESILIENT NETWORKS	F	RNW	2	0	2	0	3	4	
140	MIN	MIN-CORE	23MRFT01	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY	R	IFST	3	0	2	0	4	5	
141	MIN	MIN-CORE	23MRFT02	FOOD ANALYSIS AND QUALITY ASSURANCE	R	FAQA	3	0	2	0	4	5	
142	MIN	MIN-CORE	23MRFT03	FOOD SAFETY AND REGULATIONS	R	FSR	3	1	0	0	4	4	
143	MIN	MIN-CORE	23MRFT04	FOOD ENGINEERING	R	FEG	3	0	2	0	4	5	
144	MIN	MIN-CORE	23MRBA01M	ORGANIZATIONAL BEHAVIOUR	M	OBR	4	0	0	0	4	4	
145	MIN	MIN-CORE	23MRBA02M	MARKETING MANAGEMENT	M	MMG	4	0	0	0	4	4	
146	MIN	MIN-CORE	23MRBA03M	FINANCIAL MANAGEMENT	M	FMG	4	0	0	0	4	4	
147	MIN	MIN-CORE	23MRBA04M	HUMAN RESOURCE MANAGEMENT	M	HRM	4	0	0	0	4	4	
148	MIN	MIN-CORE	23MRAC01M	AI FOR BUSINESS STRATEGY	M	ABS	4	0	0	0	4	4	
149	MIN	MIN-CORE	23MRAC02M	AI STRATEGY AND GOVERNANCE	M	ASG	4	0	0	0	4	4	
150	MIN	MIN-CORE	23MRAC03M	SUCCESSFUL AI STRATEGIES : A CEO'S PERSPECTIVES	M	SAI	4	0	0	0	4	4	
151	MIN	MIN-CORE	23MRAC04M	CRAFTING A COMPETITIVE ADVANTAGE	M	CCA	4	0	0	0	4	4	
152	MIN	MIN-CORE	23MRDM01M	FUNDAMENTALS OF DIGITAL MARKETING	M	FDM	4	0	0	0	4	4	
153	MIN	MIN-CORE	23MRDM02M	SOCIAL MEDIA MARKETING	M	SMM	4	0	0	0	4	4	
154	MIN	MIN-CORE	23MRDM03M	SERACH ENGINE OPTIMIZATION	M	SEO	4	0	0	0	4	4	

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155	MIN	MIN-CORE	23MRDM04M	ARTIFICIAL INTELLIGENCE IN MARKETING	M	AIM	4	0	0	0	4	4	
156	MIN	MIN-CORE	23MRFA01M	FOUNDATIONS AND APPLICATIONS OF FINANCIAL TECHNOLOGY	M	AFT	4	0	0	0	4	4	
157	MIN	MIN-CORE	23MRFA02M	DECENTRALISED FINANCE: THE FUTURE OF FINANCE	M	DFFF	4	0	0	0	4	4	
158	MIN	MIN-CORE	23MRFA03M	FINTECH INNOVATIONS	M	FIV	4	0	0	0	4	4	
159	MIN	MIN-CORE	23MRFA04M	USING MACHINE LEARNING IN TRADING AND FINANCE	M	ML	4	0	0	0	4	4	
160	MIN	MIN-CORE	23MRIB01M	INTERNATIONAL BUSINESS ESSENTIALS	M	IBET	4	0	0	0	4	4	
161	MIN	MIN-CORE	23MRIB02M	INTERNATIONAL BUSINESS ENVIRONMENT	M	IBEV	4	0	0	0	4	4	
162	MIN	MIN-CORE	23MRIB03M	INTERNATIONAL BUSINESS OPERATIONS	M	IBO	4	0	0	0	4	4	
163	MIN	MIN-CORE	23MRIB04M	INTERNATIONAL BUSINESS MODELS	M	IBM	4	0	0	0	4	4	
164	MIN	MIN-CORE	23MROB01M	ORGANIZATIONAL BEHAVIOUR	M	POM	4	0	0	0	4	4	
165	MIN	MIN-CORE	23MROB02M	ORGANIZATIONAL BEHAVIOUR MODELS	M	OBM	4	0	0	0	4	4	
166	MIN	MIN-CORE	23MROB03M	ORGANIZATIONAL CHANGE AND DEVELOPMENT	M	OCD	4	0	0	0	4	4	
167	MIN	MIN-CORE	23MROB04M	LEADERSHIP IN ORGANIZATION	M	LIO	4	0	0	0	4	4	
168	MIN	MIN-CORE	23MRIM01	APPLIED DESIGN THINKING	R	ADT	3	0	2	0	4	5	
169	MIN	MIN-CORE	23MRIM02	BUSINESS MODEL INNOVATION	R	BMI	3	0	2	0	4	5	
170	MIN	MIN-CORE	23MRIM03	VENTURE MANAGEMENT	R	VMT	3	0	2	0	4	5	
171	MIN	MIN-CORE	23MRIM04	BUSINESS AND LEADERSHIP	R	BL	3	0	2	0	4	5	
172	MIN	MIN-CORE	23MRTP01	INTRODUCTION TO TECHNOLOGICAL ENTREPRENEURSHIP	R	ITEP	3	0	2	0	4	5	
173	MIN	MIN-CORE	23MRTP02	LEAN STARTUP LAUNCHPAD	R	LSLP	3	0	2	0	4	5	
174	MIN	MIN-CORE	23MRTP03	ENTREPRENEURSHIP AND VENTURE CAPITAL	R	EVC	3	0	2	0	4	5	
175	MIN	MIN-CORE	23MRTP04	BUILDING AND SUSTAINING A SUCCESSFUL ENTERPRISE	R	BSSE	3	0	2	0	4	5	
176	MIN	MIN-CORE	23MRCL01	PRINCIPLES OF COMPANIES ACT AND CORPORATE GOVERNANCE	R	PCACG	3	0	2	0	4	5	
177	MIN	MIN-CORE	23MRCL02	MERGERS, ACQUISITIONS AND PRIVATE EQUITY	R	MAPE	3	0	2	0	4	5	
178	MIN	MIN-CORE	23MRCL03	INSOLVENCY AND BANKRUPTCY LAW	R	IBL	3	0	2	0	4	5	
179	MIN	MIN-CORE	23MRCL04	COMPETITION LAW AND PRACTICE	R	CLP	3	0	2	0	4	5	

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180	MIN	MIN-CORE	23MRIP01	EMERGENCE AND DEVELOPMENT OF IPR	R	EDIPR	3	0	2	0	4	5	
181	MIN	MIN-CORE	23MRIP02	LAW OF COPYRIGHT	R	LOCR	3	0	2	0	4	5	
182	MIN	MIN-CORE	23MRIP03	LAW OF PATENTS	R	LOPS	3	0	2	0	4	5	
183	MIN	MIN-CORE	23MRIP04	LAW OF TRADEMARK	R	LOTM	3	0	2	0	4	5	
184	MIN	MIN-CORE	23MRCM01	LINEAR ALGEBRA	R	LAG	2	2	0	0	4	4	
185	MIN	MIN-CORE	23MRCM02	ADVANCED NUMERICAL ANALYSIS	R	ANA	2	2	0	0	4	4	
186	MIN	MIN-CORE	23MRCM03	MATHEMATICAL MODELLING	R	MML	3	0	2	0	4	5	
187	MIN	MIN-CORE	23MRCM04	STOCHASTIC PROCESSES & OPTIMIZATION	R	SPO	2	2	0	0	4	4	
188	MIN	MIN-CORE	23MRCM05	FUZZY MATHEMATICS AND ITS APPLICATIONS	R	FMAA	2	2	0	0	4	4	
189	MIN	MIN-CORE	23MRPY01	BASICS OF PHARMACOLOGY	R	BOP	3	0	2	0	4	5	
190	MIN	MIN-CORE	23MRPY02	ADVANCED PHARMACOLOGY - I	R	AP-I	3	0	2	0	4	5	
191	MIN	MIN-CORE	23MRPY03	EXPERIMENTAL PHARMACOLOGY	R	EPC	3	0	2	0	4	5	
192	MIN	MIN-CORE	23MRPY04	ADVANCED PHARMACOLOGY - II	R	AP-II	3	0	2	0	4	5	
193	MIN	MIN-CORE	23MRCA01	INTRODUCTION TO CREATIVE ARTS	R	ICA	0	0	6	4	4	10	
194	MIN	MIN-CORE	23MRCA02	DRAWING AND SKETCHING	R	DAS	0	0	6	4	4	10	
195	MIN	MIN-CORE	23MRCA03	PAINTING	R	PNT	0	0	6	4	4	10	
196	MIN	MIN-CORE	23MRCA04	CREATIVE WRITING	R	CWT	0	0	6	4	4	10	
197	MIN	MIN-CORE	23MRPA01	FUNDAMENTALS OF AGRONOMY	R	FOA	3	0	2	0	4	5	
198	MIN	MIN-CORE	23MRPA02	INTRODUCTORY AGROMETEOROLOGY AND CLIMATE CHANGE	R	IACC	3	0	2	0	4	5	
199	MIN	MIN-CORE	23MRPA03	GEOINFORMATICS AND NANOTECHNOLOGY FOR PRECISION FARMING	R	GNPF	3	0	2	0	4	5	
200	MIN	MIN-CORE	23MRPA04	PROTECTED CULTIVATION AND POST-HARVEST TECHNOLOGIES	R	PCPHT	3	0	2	0	4	5	
201	MIN	MIN-CORE	23MRWS02	SOIL AND WATER CONSERVATION ENGINEERING	R	SWCE	3	0	2	0	4	5	
202	MIN	MIN-CORE	23MRWS03	IRRIGATION WATER MANAGEMENT	R	IWM	3	0	2	0	4	5	
203	MIN	MIN-CORE	23MRWS04	RAINFED AGRICULTURE AND WATERSHED MANAGEMENT	R	RAWM	3	0	2	0	4	5	
204	MIN	MIN-CORE	23MRID01	INTRODUCTION TO INTERIOR DESIGN	R	IID	3	0	2	0	4	5	
205	MIN	MIN-CORE	23MRID02	SPACE PLANNING AND LAYOUT	R	SPL	3	0	2	0	4	5	

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206	MIN	MIN-CORE	23MRID03	INTERIOR MATERIAL AND FINISHES	R	IMF	3	0	2	0	4	5	
207	MIN	MIN-CORE	23MRID04	FURNITURE AND ACCESSORIES DESIGN	R	FAD	3	0	2	0	4	5	
208	MIN	MIN-CORE	24EC1101	FUNDAMENTALS OF IOT AND SENSORS	R	FIS	2	0	4	0	4	6	
209	MIN	MIN-CORE	24MT1002	DISCRETE MATHEMATICS	R	DMS	2	2	0	0	4	4	
210	MIN	MIN-CORE	23MRAG01	INTRODUCTION TO GAME MATH	R	IGM	0	0	6	4	4	10	
211	MIN	MIN-CORE	23MRAG02	DRAWING BASICS	R	DBS	0	0	6	4	4	10	
212	MIN	MIN-CORE	23MRAG03	GRAPHIC DESIGN	R	GDS	0	0	6	4	4	10	
213	MIN	MIN-CORE	23MRAG04	CONCEPTS OF 3D	R	C3D	0	0	6	4	4	10	
214	MIN	MIN-CORE	23MRBM01	BIOMEDICAL DATA INTEGRATION	R	BMDI	3	0	2	0	4	5	
215	MIN	MIN-CORE	23MRBM02	MEDICAL IMAGING	R	MI	3	0	2	0	4	5	
216	MIN	MIN-CORE	23MRBM03	PHARMACEUTICAL ENGINEERING	R	PME	3	0	2	0	4	5	
217	MIN	MIN-CORE	23MRBM04	REGENERATIVE MEDICINE	R	RM	3	0	2	0	4	5	
218	MIN	MIN-CORE	23MRCR01	INTRODUCTION CLINICAL RESEARCH	R	ICR	3	0	2	0	4	5	
219	MIN	MIN-CORE	23MRMI01	MANAGEMENT INFORMATION SYSTEMS	R	MIS	3	1	0	0	4	4	
220	MIN	MIN-CORE	23MRMI02	INFORMATION SYSTEM ANALYSIS & DESIGN	R	ISAD	3	1	0	0	4	4	
221	MIN	MIN-CORE	23MRCR02	CLINICAL TRAIL MANAGEMENT	R	CTM	3	0	2	0	4	5	
222	MIN	MIN-CORE	23MRCR03	ETHICS IN CLINICAL RESEARCH	R	ECR	3	0	2	0	4	5	
223	MIN	MIN-CORE	23MRCR04	PRECISION MEDICINE	R	PM	4	0	0	0	4	4	
224	MIN	MIN-CORE	23MRMI04	EMERGING TECHNOLOGIES IN MIS	R	ETIM	3	1	0	0	4	4	
225	MIN	MIN-CORE	23MRMI03	BUSINESS INTELLIGENCE & ANALYTICS	R	BIA	4	0	0	0	4	4	
226	MIN	MIN-CORE	23MRBI01	BIOINFORMATICS	R	BI	3	0	2	0	4	5	
227	MIN	MIN-CORE	23MRFM01	FILM AESTHETICS	R	FAS	0	0	6	4	4	10	
228	MIN	MIN-CORE	23MRFM02	SCREEN WRITING	R	SWT	0	0	6	4	4	10	
229	MIN	MIN-CORE	23MRFM03	CINEMATIC LIGHTING	R	CML	0	0	6	4	4	10	
230	MIN	MIN-CORE	23MRFM04	SOUND DESIGN	R	SDS	0	0	6	4	4	10	
231	MIN	MIN-CORE	23MRGD01	INTRODUCTION TO GRAPHIC DESIGN	R	IGD	0	0	6	4	4	10	
232	MIN	MIN-CORE	23MRGD02	TYPOGRAPHY	R	TPY	0	0	6	4	4	10	
233	MIN	MIN-CORE	23MRGD03	VISUAL IDENTITY AND BRANDING	R	VIB	0	0	6	4	4	10	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
234	MIN	MIN-CORE	23MRGD04	PRINT DESIGN	R	PRDG	0	0	6	4	4	10	
235	MIN	MIN-CORE	23MRBI02	BIOSTATISTICS AND DATA ANALYSIS	R	BDA	3	0	2	0	4	5	
236	MIN	MIN-CORE	23MRBI03	HEALTH INFORMATION SYSTEMS	R	HIS	3	0	2	0	4	5	
237	MIN	MIN-CORE	23MRBI04	BIOMEDICAL DATA INTEGRATION	R	BDI	3	0	2	0	4	5	
238	MIN	MIN-CORE	23MRBU01M	INTRODUCTION TO BUSINESS ANALYTICS	M	IBA	4	0	0	0	4	4	
239	MIN	MIN-CORE	23MRBU02M	PREDICTIVE MODELING AND ANALYTICS	M	PAM	4	0	0	0	4	4	
240	MIN	MIN-CORE	23MRBU03M	DATA MINING AND MACHINE LEARNING	M	DMML	4	0	0	0	4	4	
241	MIN	MIN-CORE	23MRBU04M	MARKETING ANALYTICS	M	MAT	4	0	0	0	4	4	
242	MIN	MIN-CORE	23MRBU05M	FINANCIAL ANALYTICS	M	FAT	4	0	0	0	4	4	
243	MIN	MIN-CORE	23MRBU06M	SUPPLY CHAIN ANALYTICS	M	SCAT	4	0	0	0	4	4	
244	MIN	MIN-CORE	23MRBU07M	HEALTHCARE ANALYTICS	M	HCAT	4	0	0	0	4	4	
245	MIN	MIN-CORE	23MREG01M	ETHICS OF ARTIFICIAL INTELLIGENCE	M	EOAI	4	0	0	0	4	4	
246	MIN	MIN-CORE	23MREG02M	ARTIFICIAL INTELLIGENCE AND LAW	M	AIAL	4	0	0	0	4	4	
247	MIN	MIN-CORE	23MREG03M	DATA ETHICS, AI & RESPONSIBLE INNOVATION	M	DEAIRI	4	0	0	0	4	4	
248	MIN	MIN-CORE	23MREG04M	FAIRNESS, ACCOUNTABILITY & TRANSPARENCY IN AI	M	FATAI	4	0	0	0	4	4	
249	MSDC	MIN-SDP	23MRGD05	PUBLICATION DESIGN	R	PUDG	0	0	6	4	4	10	
250	MSDC	MIN-SDP	23MRFM05	DIGITAL PHOTOGRAPHY	R	DPG	0	0	6	4	4	10	
251	MSDC	MIN-SDP	23MRMI05	BUSINESS INTELLIGENCE & DATA ANALYTICS PROJECT	R	BIDA	0	0	6	4	4	10	
252	MSDC	MIN-SDP	23MRAG05	DIGITAL ART	R	DTA	0	0	6	4	4	10	
253	MSDC	MIN-SDP	23MRBA05M	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	M	LSCM	0	0	6	4	4	10	
254	MSDC	MIN-SDP	23MRID05	DESIGN PRESENTATION AND COMMUNICATION	R	DPC	0	0	6	4	4	10	
255	MSDC	MIN-SDP	23MRPA05	MODERN FARMING TECHNIQUES AND INNOVATIONS	R	AELP	0	0	6	4	4	10	
256	MSDC	MIN-SDP	23MRCA05	SCULPTURE	R	SCP	0	0	6	4	4	10	
257	MSDC	MIN-SDP	23MRPY05	PRACTICAL PHARMACOLOGY	R	PRI	0	0	6	4	4	10	
258	MSDC	MIN-SDP	23MRCM06	TRANSFORM TECHNIQUES FOR ENGINEERING	R	TTE	2	0	2	4	4	8	
259	MSDC	MIN-SDP	23MRCM07	STATISTICS WITH R PROGRAMMING	R	SWRP	2	0	2	4	4	8	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
260	MSDC	MIN-SDP	23MRCM08	MATRIX COMPUTATION	R	MCT	2	0	2	4	4	8	
261	MSDC	MIN-SDP	23MRIP05	LAW OF DESIGNS, GEOGRAPHICAL INDICATIONS AND PLANT VARIETIES	R	LODGP	0	0	6	4	4	10	
262	MSDC	MIN-SDP	23MRCL05	COMMERCIAL CONTRACT DRAFTING	R	CCD	0	0	6	4	4	10	
263	MSDC	MIN-SDP	23MRTP05	TECH INNOVATION PROJECT FOR ENTREPRENEURS	R	TIPFE	0	0	6	4	4	10	
264	MSDC	MIN-SDP	23MRIM05	PROJECT INNOVATE: STRATEGIES FOR ENTREPRENEURIAL GROWTH	R	PISEG	0	0	6	4	4	10	
265	MSDC	MIN-SDP	23MROB05	TEAM BUIDLING AND COLLABORATION SKILLS FOR MANAGERS	M	TBCM	0	0	6	4	4	10	
266	MSDC	MIN-SDP	23MRIB05	PROFESSIONAL SKILLS FOR INTERNATIONAL BUSINESS	M	PIB	0	0	6	4	4	10	
267	MSDC	MIN-SDP	23MRFA05	TRADING ALGORITHMNS	M	TA	0	0	6	4	4	10	
268	MSDC	MIN-SDP	23MRDM05	CONTENT MARKETING	M	CM	0	0	6	4	4	10	
269	MSDC	MIN-SDP	23MRAC05	AI APPLICATIONS FOR BUSINESS SUCCESS	M	AIA	0	0	6	4	4	10	
270	MSDC	MIN-SDP	23MRFT05	FOOD PACKAGING TECHNOLOGY	R	FPT	2	0	2	4	4	8	
271	MSDC	MIN-SDP	23SDCS06A	CERTIFIED GAME DEVELOPER	A	CGD	0	0	6	4	4	10	
272	MSDC	MIN-SDP	23SDEC01A	ELECTRONIC SYSTEM DESIGN	A	ESD	0	0	6	4	4	10	
273	MSDC	MIN-SDP	23SDEC02A	EMBEDDED SYSTEM AUTOMATION	A	ESDA	0	0	6	4	4	10	
274	MSDC	MIN-SDP	23SDAD01A	DATA ANALYTICS AND VISUALIZATION	A	DAV	0	0	6	4	4	10	
275	MSDC	MIN-SDP	23SDCE02A	BUILDING INFORMATION MODELLING	A	BIM	0	0	6	4	4	10	
276	MSDC	MIN-SDP	23SDCS05A	CLOUD BASED SECURITY SPECIALITY	A	CBSS	0	0	6	4	4	10	
277	MSDC	MIN-SDP	23SDBT05A	COMPUTER AIDED DRUG DESIGN	A	CADD	0	0	6	4	4	10	
278	MSDC	MIN-SDP	23SDEE04A	AI & ML FOR SMART GRIDS	A	AIMLSG	0	0	6	4	4	10	
279	MSDC	MIN-SDP	23SDCE01A	VISUALIZATION AND MODELLING FOR STRUCTURAL DESIGN	A	VMSD	0	0	6	4	4	10	
280	MSDC	MIN-SDP	23SDCS12A	FULL STACK APPLICATION DEVELOPMENT	A	FSD	0	0	6	4	4	10	
281	MSDC	MIN-SDP	23SDEE05A	MODELING AND SIMULATION OF GREEN ENERGY SYSTEMS	A	GML	0	0	6	4	4	10	
282	MSDC	MIN-SDP	23SDBT01A	MEDICAL LAB TECHNOLOGY	A	MLT	0	0	6	4	4	10	
283	SMFC	SMFC-CORE	23EC2209R	ELECTROMAGNETIC WAVES & TRANSMISSION LINES	R	EMWTL	3	0	0	0	3	3	
284	SMFC	SMFC-CORE	23ME1004	WORKSHOP PRACTICES FOR ENGINEERS	R	WPE	0	0	4	0	2	4	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
285	SMFC	SMFC-	23ME2208	MANUFACTURING PROCESSES	R	MP	3	0	2	0	4	5	
286	SMFC	SMFC-	23ME3113R	MANUFACTURING TECHNOLOGY	R	MT	2	0	2	0	3	4	
287	SMFC	SMFC-	23BT1101	CELL BIOLOGY	R	CB	3	0	0	0	3	3	
288	SMFC	SMFC-	23BT2103R	BIOCHEMISTRY	R	BCM	3	0	2	0	4	5	
289	SMFC	SMFC-	23BT2105R	IMMUNOLOGY	R	IMM	3	0	2	0	4	5	
290	SMFC	SMFC-	23BT2206	MOLECULAR BIOLOGY	R	MBY	3	0	0	0	3	3	
291	SMFC	SMFC-CORE	23EE3208R	POWER SYSTEM PROTECTION & CONTROL	R	PSPC	2	0	2	2	3.5	6	
292	SMFC	SMFC-CORE	23CI2203	MANAGEMENT INFORMATION SYSTEM - ERP	R	MIS	2	0	0	0	2	2	
293	SMFC	SMFC-CORE	23EC2104R	ANALOG ELECTRONIC CIRCUIT DESIGN	R	AECD	3	0	2	2	4.5	7	
294	SMFC	SMFC-	22CE1201	ENGINEERING GEOLOGY	R	EGY	3	0	2	0	4	5	
295	SMFC	SMFC-	23CE3109	ENVIRONMENTAL ENGINEERING	R	EVE	3	0	2	0	4	5	
296	SMFC	SMFC-	23CE2207	CONCRETE TECHNOLOGY	R	CT	3	0	2	4	5	9	
297	SMFC	SMFC-	23EE2205R	POWER ELECTRONICS	R	PES	3	0	2	0	4	5	
298	SMFC	SMFC-	23EE2101	ELECTRICAL CIRCUITS	R	ELC	2	0	2	0	3	4	
299	SMFC	SMFC-	24AG1102	FILM AESTHETICS	R	FAS	2	1	0	0	3	3	
300	SMFC	SMFC-	24AG1103	DRAWING BASICS	R	DBS	2	0	2	0	3	4	
301	SMFC	SMFC-	24AG1205A	DIGITAL MEDIA DESIGN	A	DMG	2	0	6	0	5	8	
302	SMFC	SMFC-	24AG1206	VISUAL ANALYSIS TOOLS	R	VAT	2	1	0	0	3	3	
303	SMFC	SMFC-	24AG1207A	MATTE PAINTING	A	MPT	2	0	6	0	5	8	
304	SMFC	SMFC-	24AG2109A	SOUND DESIGN	A	SDS	0	2	6	0	5	8	
305	SMFC	SMFC-CORE	24AG2210A	MEDIA MANAGEMENT AND ENTREPREUNERSHIP	A	MME	4	0	0	0	4	4	
306	SMFC	SMFC-	24AG2211A	POST PRODUCTION TOOLS	A	PPT	0	0	8	0	4	8	
307	SMFC	SMFC-	24BB1101R	MANAGERIAL ECONOMICS	R	ME	3	0	2	0	4	5	
308	SMFC	SMFC-	24BB1102R	PERSPECTIVES OF MANAGEMENT	R	POM	3	0	2	0	4	5	
309	SMFC	SMFC-	24BB1103R	BUSINESS ENVIRONMENT	R	BE	3	0	2	0	4	5	
310	SMFC	SMFC-	24BB1204R	ORGANIZATIONAL BEHAVIOUR	R	OB	3	0	2	0	4	5	
311	SMFC	SMFC-	24BB1205R	HUMAN RESOURCE MANAGEMENT	R	HRM	3	0	2	0	4	5	
312	SMFC	SMFC-CORE	23AD2103R	SYSTEM DESIGN & INTRODUCTION TO CLOUD	R	SDC	3	0	2	0	4	5	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
313	SMFC	SMFC-	23BT2104	MICROBIOLOGY	R	MBG	3	0	2	0	4	5	
314	SMFC	SMFC-CORE	23AD02HF	DATA ENGINEERING AND ARCHITECTURE	R	DEA	3	0	2	0	4	5	
315	SMFC	SMFC-	23EC2226F	WIRELESS COMMUNICATIONS	F	WC	2	0	2	0	3	4	
316	SMFC	SMFC-	23BT2215	PROCESS ENGINEERING PRINCIPLES	R	PEP	2	0	2	0	3	4	
317	SMFC	SMFC-	23BT2224F	BIOREACTOR OPERATIONS	F	BO	2	0	2	0	3	4	
318	SMFC	SMFC-	23BT3213R	DOWNSTREAM PROCESSING	R	DSP	2	0	4	0	4	6	
319	SMFC	SMFC-CORE	23AD01HF	MACHINE LEARNING FOR HEALTHCARE	R	MLH	3	0	2	0	4	5	
320	SMFC	SMFC-	23AD03HF	REINFORCEMENT LEARNING	R	RIL	3	0	2	0	4	5	
321	SMFC	SMFC-	23AD04HF	EXPLAINABLE AI	R	EAI	3	0	2	0	4	5	
322	SMFC	SMFC-	23AD2205R	DEEP LEARNING	R	DL	3	0	2	4	5	9	
323	SMFC	SMFC-	23AD3207R	NATURAL LANGUAGE PROCESSING	R	NLP	3	0	2	0	4	5	
324	SMFC	SMFC-CORE	23AD4108	ETHICS FOR ARTIFICIAL INTELLIGENCE	R	EAI	1	0	0	0	1	1	
325	SMFC	SMFC-	23BT3214	BIOINFORMATICS	R	BI	2	0	2	0	3	4	
326	SMFC	SMFC-	23IN2101R	IOT SYSTEM DESIGN	R	IOTPA	3	0	2	0	4	5	
327	SMFC	SMFC-	23IN3104R	REAL TIME OPERATING SYSTEMS	R	RTOS	3	0	2	0	4	5	
328	SMFC	SMFC-	23IN3105R	EMBEDDED SYSTEMS DESIGN	R	ESD	2	0	2	0	3	4	
329	SMFC	SMFC-	23ME2107R	THERMODYNAMICS	R	TD	3	0	0	0	3	3	
330	SMFC	SMFC-	23EE2102R	ELECTRICAL MACHINES	R	ELM	3	0	2	0	4	5	
331	SMFC	SMFC-CORE	23EE2204R	ELECTRICAL POWER GENERATION, TRANSMISSION & DISTRIBUTION	R	EPGTD	2	1	0	0	3	3	
332	SMFC	SMFC-	23EE2225F	POWER QUALITY	F	PQ	3	0	0	0	3	3	
333	SMFC	SMFC-	23ME1002	ENGINEERING GRAPHICS	R	EG	0	0	4	0	2	4	
334	SMFC	SMFC-	23ME3110R	HEAT TRANSFER	R	HT	3	0	2	0	4	5	
335	SMFC	SMFC-CORE	23ME2209R	KINEMATICS & DYNAMICS OF MACHINES	R	KDOM	3	1	2	0	5	6	
336	SMFC	SMFC-	23ME3111R	MECHANICAL ENGINEERING DESIGN	R	MED	3	0	0	0	3	3	
337	SMFC	SMFC-	24SDCA03A	WEB DEVELOPMENT USING PYTHON	A	WDP	2	0	2	4	4	8	
338	SMFC	SMFC-CORE	24AD2001R	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	R	AIML	3	0	2	0	4	5	
339	SMFC	SMFC-CORE	22FT12C1	PRINCIPLES OF FOOD PRESERVATION	R	PFP	1	0	0	4	2	5	
340	SMFC	SMFC-	22FT32C2R	FOOD PACKAGING TECHNOLOGY	R	FPT	1	0	0	4	2	5	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
341	SMFC	SMFC-	22FT1207R	FOOD MICROBIOLOGY	R	FMB	3	0	2	0	4	5	
342	SMFC	SMFC-CORE	22FT2213R	BAKERY, CONFECTIONERY AND SNACKS TECHNOLOGY	R	BCST	2	0	4	0	4	6	
343	SMFC	SMFC-CORE	22FT1104	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY	R	IFST	3	0	2	0	4	5	
344	SMFC	SMFC-CORE	24SDCM02A	ACCOUNTING INFORMATION SYSTEM	A	AIS	3	0	0	4	4	7	
345	SMFC	SMFC-	22FT1102	FOOD CHEMISTRY	R	FC	3	0	2	0	4	5	
346	SMFC	SMFC-	22FT1105	FOOD BIOCHEMISTRY	R	FBC	3	0	2	0	4	5	
347	SMFC	SMFC-CORE	22FT2109R	PROCESSING OF HORTICULTURAL PRODUCE	R	PHP	3	0	2	0	4	5	
348	SMFC	SMFC-CORE	22FT3215R	TECHNOLOGY OF MEAT AND POULTRY	R	TMP	3	0	2	0	4	5	
349	SMFC	SMFC-	23ACCAMA	MANAGEMENT ACCOUNTING	R	MA	3	2	0	0	5	5	
350	SMFC	SMFC-	23ACCAPM	PERFORMANCE MANAGEMENT	R	PM	3	2	0	0	5	5	
351	SMFC	SMFC-	22CM1206	ADVANCED COST ACCOUNTING	R	ACA	3	2	0	0	5	5	
352	SMFC	SMFC-CORE	22CM31B5	ACCOUNTING & REPORTING STANDARDS	R	ARS	3	2	0	0	5	5	
353	SMFC	SMFC-	23ACCATX	TAXATION	R	TXT	3	2	0	0	5	5	
354	SMFC	SMFC-	22CM21B2	INCOME TAX LAW & PRACTICE	R	ITLP	3	2	0	0	5	5	
355	SMFC	SMFC-CORE	24BB2108R	FUNDAMENTALS OF DIGITAL MARKETING	R	DM	3	0	2	0	4	5	
356	SMFC	SMFC-CORE	24BB2109R	PRODUCTION & OPERATIONS MANAGEMENT	R	PROM	3	0	2	0	4	5	
357	SMFC	SMFC-	24CA1101	COMPUTER ORGANIZATION	R	CO	2	2	0	0	4	4	
358	SMFC	SMFC-CORE	24CA1102	ESSENTIALS OF INFORMATION TECHNOLOGY	R	EIT	3	0	2	0	4	5	
359	SMFC	SMFC-CORE	24CA1103R	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	R	CTSD	3	0	2	0	4	5	
360	SMFC	SMFC-	24CA1204R	ESSENTIALS OF OPERATING SYSTEM	R	EOS	3	1	0	0	4	4	
361	SMFC	SMFC-	24CA1205R	DATA STRUCTURES	R	DS	3	0	2	0	4	5	
362	SMFC	SMFC-	24CA1206R	DATABASE MANAGEMENT SYSTEMS	R	DBMS	3	0	2	0	4	5	
363	SMFC	SMFC-CORE	24CA2107R	DESIGN AND ANALYSIS OF ALGORITHMS	R	DAA	3	1	0	0	4	4	
364	SMFC	SMFC-SDP	24SDAG03	DIGITAL ART	R	DTA	0	0	4	4	3	8	
365	SMFC	SMFC-SDP	24SDBB01A	IT FOR BUSINESS MANAGERS & MIS	A	ITBM	2	0	0	8	4	10	
366	SMFC	SMFC-SDP	23SDME01A	VISUALIZATION AND MODELLING FOR ENGINEERING DESIGN	A	VMED	0	0	6	4	4	10	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
367	SMFC	SMFC-SDP	23SDIN01A	IOT HARDWARE PROGRAMMING	A	IOTHP	0	0	6	4	4	10	
368	SMFC	SMFC-SDP	23SDEE01A	VISUALIZATION AND MODELING OF CIRCUITS	A	VAMC	0	0	6	4	4	10	

Category & Grouping

S#	Category	Group Name
1	MINOR	AI AND COMPETITIVE ADVANTAGE
2	MINOR	AI ETHICS AND GOVERNANCE
3	MINOR	ANIMATION AND GAMING
4	MINOR	BUSINESS ADMINISTRATION
5	MINOR	BUSINESS ANALYTICS
6	MINOR	CONSTRUCTION MANAGEMENT
7	MINOR	COMPUTATIONAL MATHEMATICS
8	MINOR	COMPUTER ENGINEERING
9	MINOR	MANAGEMENT INFORMATION SYSTEMS
10	MINOR	CORPORATE LAW
11	MINOR	CREATIVE ARTS
12	MINOR	DIGITAL MARKETING AND AUTOMATION
13	MINOR	SIGNAL PROCESSING
14	MINOR	GREEN ENERGY SYSTEMS
15	MINOR	FILM MAKING
16	MINOR	FINTECH AND ALGORITHMIC TRADING
17	MINOR	FOOD TECHNOLOGY
18	MINOR	GRAPHIC DESIGN
19	MINOR	INNOVATION MANAGEMENT AND ENTREPRENEURSHIP
20	MINOR	INTELLECTUAL PROPERTY LAW
21	MINOR	INTERIOR DESIGN
22	MINOR	INTERNATIONAL BUSINESS
23	MINOR	MECHATRONICS
24	MINOR	ORGANIZATIONAL BEHAVIOUR
25	MINOR	PHARMACOLOGY
26	MINOR	PRECISION AGRICULTURE
27	MINOR	TECHNOPRENEURSHIP
28	MINOR	WATER SCIENCE AND MANAGEMENT
29	MINOR	STRUCTURAL ENGINEERING

S#	Category	Group Name
30	MINOR	BIO-MEDICAL ENGINEERING
31	MINOR	CLINICAL RESEARCH
32	MINOR	BIO-MEDICAL INFORMATICS
33	MINOR	COMPUTER SCIENCE
34	MINOR	CYBER SECURITY AND FORENSICS
35	MINOR	UX DESIGN
36	MINOR	BLOCKCHAIN AND CRYPTOCURRENCIES
37	MINOR	GAME DEVELOPMENT
38	MINOR	SMART GRID AUTOMATION
39	MINOR	COMMUNICATIONS AND NETWORKING
40	MINOR	ROBOTICS AND AUTOMATION
41	DOUBLE MAJOR	SECOND MAJOR CSE FOR FIRST MAJOR BBA / B.COM / BSC / BA
42	DOUBLE MAJOR	SECOND MAJOR CSIT FOR FIRST MAJOR BBA / B.COM / BSC / BA
43	DOUBLE MAJOR	SECOND MAJOR EEE FOR FIRST MAJOR BBA / B.COM / BSC / BCA / BA
44	DOUBLE MAJOR	SECOND MAJOR ECE FOR FIRST MAJOR CIVIL / BBA / B.COM / BSC / BCA / BA
45	DOUBLE MAJOR	SECOND MAJOR IOT FOR FIRST MAJOR BBA / B.COM / BSC / BCA / BA
46	DOUBLE MAJOR	SECOND MAJOR AIDS FOR FIRST MAJOR ECE / IOT / CSE / CSIT
47	DOUBLE MAJOR	SECOND MAJOR ME FOR FIRST MAJOR BBA / B.COM / BSC / BCA / BA
48	DOUBLE MAJOR	SECOND MAJOR BT FOR FIRST MAJOR B.TECH / BBA / B.COM / BSC / BCA / BA
49	DOUBLE MAJOR	SECOND MAJOR ANIMATION AND GAMING FOR FIRST MAJOR B.TECH / BBA / B.COM /
50	DOUBLE MAJOR	SECOND MAJOR BUSINESS ADMINISTRATION FOR FIRST MAJOR B.TECH / B.COM / BSC
51	DOUBLE MAJOR	SECOND MAJOR COMPUTER APPLICATIONS FOR FIRST MAJOR B.COM / BBA / BSC / BA
52	SPECIALIZATION	ECONOMICS

Category & Grouping Courses

1. MINOR: AI AND COMPETITIVE ADVANTAGE

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRAC01M	AI FOR BUSINESS STRATEGY	M	ABS	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MRAC02M	AI STRATEGY AND GOVERNANCE	M	ASG	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MRAC03M	SUCCESSFUL AI STRATEGIES : A CEO'S PERSPECTIVES	M	SAI	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MRAC04M	CRAFTING A COMPETITIVE ADVANTAGE	M	CCA	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23MRAC05	AI APPLICATIONS FOR BUSINESS SUCCESS	M	AIA	0	0	6	4	4	10	

2. MINOR: AI ETHICS AND GOVERNANCE

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MREG01M	ETHICS OF ARTIFICIAL INTELLIGENCE	M	EOAI	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MREG02M	ARTIFICIAL INTELLIGENCE AND LAW	M	AIAL	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MREG03M	DATA ETHICS, AI & RESPONSIBLE INNOVATION	M	DEAIRI	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MREG04M	FAIRNESS, ACCOUNTABILITY & TRANSPARENCY IN AI	M	FATAI	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23SDAD01A	DATA ANALYTICS AND VISUALIZATION	A	DAV	0	0	6	4	4	10	

3. MINOR: ANIMATION AND GAMING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRAG01	INTRODUCTION TO GAME MATH	R	IGM	0	0	6	4	4	10	
2	MIN	MIN-CORE	23MRAG02	DRAWING BASICS	R	DBS	0	0	6	4	4	10	
3	MIN	MIN-CORE	23MRAG03	GRAPHIC DESIGN	R	GDS	0	0	6	4	4	10	
4	MIN	MIN-CORE	23MRAG04	CONCEPTS OF 3D	R	C3D	0	0	6	4	4	10	
5	MSDC	MIN-SDP	23MRAG05	DIGITAL ART	R	DTA	0	0	6	4	4	10	

4. MINOR: BUSINESS ADMINISTRATION

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRBA01M	ORGANIZATIONAL BEHAVIOUR	M	OBR	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MRBA02M	MARKETING MANAGEMENT	M	MMG	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MRBA03M	FINANCIAL MANAGEMENT	M	FMG	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MRBA04M	HUMAN RESOURCE MANAGEMENT	M	HRM	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23MRBA05M	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	M	LSCM	0	0	6	4	4	10	

5. MINOR: BUSINESS ANALYTICS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRBU01M	INTRODUCTION TO BUSINESS ANALYTICS	M	IBA	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MRBU02M	PREDICTIVE MODELING AND ANALYTICS	M	PAM	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MRBU03M	DATA MINING AND MACHINE LEARNING	M	DMML	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MRBU04M	MARKETING ANALYTICS	M	MAT	4	0	0	0	4	4	
5	MIN	MIN-CORE	23MRBU05M	FINANCIAL ANALYTICS	M	FAT	4	0	0	0	4	4	
6	MIN	MIN-CORE	23MRBU06M	SUPPLY CHAIN ANALYTICS	M	SCAT	4	0	0	0	4	4	
7	MIN	MIN-CORE	23MRBU07M	HEALTHCARE ANALYTICS	M	HCAT	4	0	0	0	4	4	
8	MSDC	MIN-SDP	23SDAD01A	DATA ANALYTICS AND VISUALIZATION	A	DAV	0	0	6	4	4	10	

6. MINOR: CONSTRUCTION MANAGEMENT

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	23CE2208R	GEOTECHNICAL ENGINEERING	R	GTE	3	0	2	0	4	5	
2	MIN	MIN-CORE	23CE2229F	ADVANCED CONSTRUCTION TECHNOLOGY	F	ACT	3	0	0	0	3	3	
3	MIN	MIN-CORE	23CE4114	CONSTRUCTION PROJECT MANAGEMENT	R	CPM	3	0	0	0	3	3	
4	MIN	MIN-CORE	23CE2208A	GEOTECHNICAL ENGINEERING	A	GTE	4	0	4	0	6	8	
5	MIN	MIN-CORE	23CE2103R	SURVEYING	R	SVY	3	0	2	4	5	9	
6	MSDC	MIN-SDP	23SDCE02A	BUILDING INFORMATION MODELLING	A	BIM	0	0	6	4	4	10	

7. MINOR: COMPUTATIONAL MATHEMATICS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRCM01	LINEAR ALGEBRA	R	LAG	2	2	0	0	4	4	
2	MIN	MIN-CORE	23MRCM02	ADVANCED NUMERICAL ANALYSIS	R	ANA	2	2	0	0	4	4	
3	MIN	MIN-CORE	23MRCM03	MATHEMATICAL MODELLING	R	MML	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRCM04	STOCHASTIC PROCESSES & OPTIMIZATION	R	SPO	2	2	0	0	4	4	
5	MIN	MIN-CORE	23MRCM05	FUZZY MATHEMATICS AND ITS APPLICATIONS	R	FMAA	2	2	0	0	4	4	
6	MSDC	MIN-SDP	23MRCM06	TRANSFORM TECHNIQUES FOR ENGINEERING	R	TTE	2	0	2	4	4	8	
7	MSDC	MIN-SDP	23MRCM07	STATISTICS WITH R PROGRAMMING	R	SWRP	2	0	2	4	4	8	
8	MSDC	MIN-SDP	23MRCM08	MATRIX COMPUTATION	R	MCT	2	0	2	4	4	8	

8. MINOR: COMPUTER ENGINEERING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CS2104R	OPERATING SYSTEMS	R	OS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23CS2205R	DESIGN AND ANALYSIS OF ALGORITHMS	R	DAA	3	0	2	4	5	9	
3	MIN	MIN-CORE	23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	R	CTSD	3	0	2	4	5	9	
4	MIN	MIN-CORE	24SC1203	DATA STRUCTURES	R	DS	3	0	2	4	5	9	
5	MIN	MIN-CORE	23CI2001	ADAPTIVE SOFTWARE ENGINEERING	R	ASE	3	1	0	0	4	4	
6	MIN	MIN-CORE	23EC1202	DIGITAL DESIGN & COMPUTER ARCHITECTURE	R	DDCA	3	0	2	0	4	5	
7	MSDC	MIN-SDP	23SDCS12A	FULL STACK APPLICATION DEVELOPMENT	A	FSD	0	0	6	4	4	10	

9. MINOR: MANAGEMENT INFORMATION SYSTEMS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRMI01	MANAGEMENT INFORMATION SYSTEMS	R	MIS	3	1	0	0	4	4	
2	MIN	MIN-CORE	23MRMI02	INFORMATION SYSTEM ANALYSIS & DESIGN	R	ISAD	3	1	0	0	4	4	
3	MIN	MIN-CORE	23MRMI04	EMERGING TECHNOLOGIES IN MIS	R	ETIM	3	1	0	0	4	4	
4	MIN	MIN-CORE	23MRMI03	BUSINESS INTELLIGENCE & ANALYTICS	R	BIA	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23MRMI05	BUSINESS INTELLIGENCE & DATA ANALYTICS PROJECT	R	BIDA	0	0	6	4	4	10	

10. MINOR: CORPORATE LAW

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRCL01	PRINCIPLES OF COMPANIES ACT AND CORPORATE GOVERNANCE	R	PCACG	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRCL02	MERGERS, ACQUISITIONS AND PRIVATE EQUITY	R	MAPE	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRCL03	INSOLVENCY AND BANKRUPTCY LAW	R	IBL	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRCL04	COMPETITION LAW AND PRACTICE	R	CLP	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRCL05	COMMERCIAL CONTRACT DRAFTING	R	CCD	0	0	6	4	4	10	

11. MINOR: CREATIVE ARTS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRCA01	INTRODUCTION TO CREATIVE ARTS	R	ICA	0	0	6	4	4	10	
2	MIN	MIN-CORE	23MRCA02	DRAWING AND SKETCHING	R	DAS	0	0	6	4	4	10	
3	MIN	MIN-CORE	23MRCA03	PAINTING	R	PNT	0	0	6	4	4	10	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
4	MIN	MIN-CORE	23MRCA04	CREATIVE WRITING	R	CWT	0	0	6	4	4	10	
5	MSDC	MIN-SDP	23MRCA05	SCULPTURE	R	SCP	0	0	6	4	4	10	

12. MINOR: DIGITAL MARKETING AND AUTOMATION

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRDM01M	FUNDAMENTALS OF DIGITAL MARKETING	M	FDM	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MRDM02M	SOCIAL MEDIA MARKETING	M	SMM	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MRDM03M	SERACH ENGINE OPTIMIZATION	M	SEO	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MRDM04M	ARTIFICIAL INTELLIGENCE IN MARKETING	M	AIM	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23MRDM05	CONTENT MARKETING	M	CM	0	0	6	4	4	10	

13. MINOR: SIGNAL PROCESSING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23EC2105R	SIGNALS & COMMUNICATION SYSTEMS	R	SCS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23EC2224F	DEEP NETWORK ARCHITECTURES	F	DNA	2	0	2	0	3	4	
3	MIN	MIN-CORE	23EC3112R	DISCRETE TIME SIGNAL PROCESSING	R	DTSP	3	0	2	0	4	5	
4	MIN	MIN-CORE	23IMP3101R	NATURAL LANGUAGE PROCESSING & APPLICATIONS	R	NLPA	3	0	2	4	5	9	
5	MIN	MIN-CORE	23MT2007	RANDOM VARIABLES AND STOCHASTIC PROCESS	R	RVASP	2	2	0	0	4	4	
6	MSDC	MIN-SDP	23SDEC01A	ELECTRONIC SYSTEM DESIGN	A	ESD	0	0	6	4	4	10	

14. MINOR: GREEN ENERGY SYSTEMS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23EE2226F	ELECTRICAL TECHNOLOGY	F	ET	2	0	2	0	3	4	
2	MIN	MIN-CORE	23GET3101R	SOLAR PV AND MICRO ENERGY TECHNOLOGIES	R	SPMET	3	0	2	4	5	9	
3	MIN	MIN-CORE	23GET3202R	WIND AND ENERGY STORAGE TECHNOLOGIES	R	WEST	3	0	0	0	3	3	
4	MIN	MIN-CORE	23GET3405M	ENERGY MANAGEMENT AND GREEN BUILDING	M	EMGB	3	0	0	0	3	3	
5	MIN	MIN-CORE	23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	R	BEEC	2	0	0	0	2	2	
6	MSDC	MIN-SDP	23SDEE05A	MODELING AND SIMULATION OF GREEN ENERGY SYSTEMS	A	GML	0	0	6	4	4	10	

15. MINOR: FILM MAKING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRFM01	FILM AESTHETICS	R	FAS	0	0	6	4	4	10	
2	MIN	MIN-CORE	23MRFM02	SCREEN WRITING	R	SWT	0	0	6	4	4	10	
3	MIN	MIN-CORE	23MRFM03	CINEMATIC LIGHTING	R	CML	0	0	6	4	4	10	
4	MIN	MIN-CORE	23MRFM04	SOUND DESIGN	R	SDS	0	0	6	4	4	10	
5	MSDC	MIN-SDP	23MRFM05	DIGITAL PHOTOGRAPHY	R	DPG	0	0	6	4	4	10	

16. MINOR: FINTECH AND ALGORITHMIC TRADING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRFA01M	FOUNDATIONS AND APPLICATIONS OF FINANCIAL TECHNOLOGY	M	AFT	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MRFA02M	DECENTRALISED FINANCE: THE FUTURE OF FINANCE	M	DFFF	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MRFA03M	FINTECH INNOVATIONS	M	FIV	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MRFA04M	USING MACHINE LEARNING IN TRADING AND FINANCE	M	ML	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23MRFA05	TRADING ALGORITHMNS	M	TA	0	0	6	4	4	10	

17. MINOR: FOOD TECHNOLOGY

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRFT01	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY	R	IFST	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRFT02	FOOD ANALYSIS AND QUALITY ASSURANCE	R	FAQA	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRFT03	FOOD SAFETY AND REGULATIONS	R	FSR	3	1	0	0	4	4	
4	MIN	MIN-CORE	23MRFT04	FOOD ENGINEERING	R	FEG	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRFT05	FOOD PACKAGING TECHNOLOGY	R	FPT	2	0	2	4	4	8	

18. MINOR: GRAPHIC DESIGN

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRGD01	INTRODUCTION TO GRAPHIC DESIGN	R	IGD	0	0	6	4	4	10	
2	MIN	MIN-CORE	23MRGD02	TYPOGRAPHY	R	TPY	0	0	6	4	4	10	
3	MIN	MIN-CORE	23MRGD03	VISUAL IDENTITY AND BRANDING	R	VIB	0	0	6	4	4	10	
4	MIN	MIN-CORE	23MRGD04	PRINT DESIGN	R	PRDG	0	0	6	4	4	10	
5	MSDC	MIN-SDP	23MRGD05	PUBLICATION DESIGN	R	PUDG	0	0	6	4	4	10	

19. MINOR: INNOVATION MANAGEMENT AND ENTREPRENEURSHIP

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRIM01	APPLIED DESIGN THINKING	R	ADT	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRIM02	BUSINESS MODEL INNOVATION	R	BMI	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRIM03	VENTURE MANAGEMENT	R	VMT	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRIM04	BUSINESS AND LEADERSHIP	R	BL	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRIM05	PROJECT INNOVATE: STRATEGIES FOR ENTREPRENEURIAL GROWTH	R	PISEG	0	0	6	4	4	10	

20. MINOR: INTELLECTUAL PROPERTY LAW

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRIP01	EMERGENCE AND DEVELOPMENT OF IPR	R	EDIPR	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRIP02	LAW OF COPYRIGHT	R	LOCR	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRIP03	LAW OF PATENTS	R	LOPS	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRIP04	LAW OF TRADEMARK	R	LOTM	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRIP05	LAW OF DESIGNS, GEOGRAPHICAL INDICATIONS AND PLANT VARIETIES	R	LODGP	0	0	6	4	4	10	

21. MINOR: INTERIOR DESIGN

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRID01	INTRODUCTION TO INTERIOR DESIGN	R	IID	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRID02	SPACE PLANNING AND LAYOUT	R	SPL	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRID03	INTERIOR MATERIAL AND FINISHES	R	IMF	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRID04	FURNITURE AND ACCESSORIES DESIGN	R	FAD	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRID05	DESIGN PRESENTATION AND COMMUNICATION	R	DPC	0	0	6	4	4	10	

22. MINOR: INTERNATIONAL BUSINESS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRIB01M	INTERNATIONAL BUSINESS ESSENTIALS	M	IBET	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MRIB02M	INTERNATIONAL BUSINESS ENVIRONMENT	M	IBEV	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MRIB03M	INTERNATIONAL BUSINESS OPERATIONS	M	IBO	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MRIB04M	INTERNATIONAL BUSINESS MODELS	M	IBM	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23MRIB05	PROFESSIONAL SKILLS FOR INTERNATIONAL BUSINESS	M	PIB	0	0	6	4	4	10	

23. MINOR: MECHATRONICS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23ME2222F	INDUSTRIAL INTERNET OF THINGS	F	IIOT	2	0	2	0	3	4	
2	MIN	MIN-CORE	23SMF3405M	ROBOTICS & INDUSTRIAL AUTOMATION	M	RIA	3	0	0	0	3	3	
3	MIN	MIN-CORE	23SMF3507	MACHINE TO MACHINE COMMUNICATION	R	MMC	3	0	0	0	3	3	
4	MIN	MIN-CORE	24EC1101	FUNDAMENTALS OF IOT AND SENSORS	R	FIS	2	0	4	0	4	6	
5	MSDC	MIN-SDP	23SDEC02A	EMBEDDED SYSTEM AUTOMATION	A	ESDA	0	0	6	4	4	10	

24. MINOR: ORGANIZATIONAL BEHAVIOUR

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MROB01M	ORGANIZATIONAL BEHAVIOUR	M	POM	4	0	0	0	4	4	
2	MIN	MIN-CORE	23MROB02M	ORGANIZATIONAL BEHAVIOUR MODELS	M	OBM	4	0	0	0	4	4	
3	MIN	MIN-CORE	23MROB03M	ORGANIZATIONAL CHANGE AND DEVELOPMENT	M	OCD	4	0	0	0	4	4	
4	MIN	MIN-CORE	23MROB04M	LEADERSHIP IN ORGANIZATION	M	LIO	4	0	0	0	4	4	
5	MSDC	MIN-SDP	23MROB05	TEAM BUIDLING AND COLLABORATION SKILLS FOR MANAGERS	M	TBCM	0	0	6	4	4	10	

25. MINOR: PHARMACOLOGY

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRPY01	BASICS OF PHARMACOLOGY	R	BOP	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRPY02	ADVANCED PHARMACOLOGY - I	R	AP-I	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRPY03	EXPERIMENTAL PHARMACOLOGY	R	EPC	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRPY04	ADVANCED PHARMACOLOGY - II	R	AP-II	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRPY05	PRACTICAL PHARMACOLOGY	R	PRI	0	0	6	4	4	10	

26. MINOR: PRECISION AGRICULTURE

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRPA01	FUNDAMENTALS OF AGRONOMY	R	FOA	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRPA02	INTRODUCTORY AGROMETEOROLOGY AND CLIMATE CHANGE	R	IACC	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRPA03	GEOINFORMATICS AND NANOTECHNOLOGY FOR PRECISION FARMING	R	GNPF	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRPA04	PROTECTED CULTIVATION AND POST-HARVEST TECHNOLOGIES	R	PCPHT	3	0	2	0	4	5	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
5	MSDC	MIN-SDP	23MRPA05	MODERN FARMING TECHNIQUES AND INNOVATIONS	R	AELP	0	0	6	4	4	10	

27. MINOR: TECHNOPRENEURSHIP

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRTP01	INTRODUCTION TO TECHNOLOGICAL ENTREPRENEURSHIP	R	ITEP	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRTP02	LEAN STARTUP LAUNCHPAD	R	LSLP	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRTP03	ENTREPRENEURSHIP AND VENTURE CAPITAL	R	EVC	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRTP04	BUILDING AND SUSTAINING A SUCCESSFUL ENTERPRISE	R	BSSE	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRTP05	TECH INNOVATION PROJECT FOR ENTREPRENEURS	R	TIPFE	0	0	6	4	4	10	

28. MINOR: WATER SCIENCE AND MANAGEMENT

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRPA01	FUNDAMENTALS OF AGRONOMY	R	FOA	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRPA02	INTRODUCTORY AGROMETEOROLOGY AND CLIMATE CHANGE	R	IACC	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRPA03	GEOINFORMATICS AND NANOTECHNOLOGY FOR PRECISION FARMING	R	GNPF	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRPA04	PROTECTED CULTIVATION AND POST-HARVEST TECHNOLOGIES	R	PCPHT	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23MRPA05	MODERN FARMING TECHNIQUES AND INNOVATIONS	R	AELP	0	0	6	4	4	10	

29. MINOR: STRUCTURAL ENGINEERING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23ME1001R	ENGINEERING MECHANICS	R	EM	3	0	0	0	3	3	
2	MIN	MIN-CORE	23CE2103R	SURVEYING	R	SVY	3	0	2	4	5	9	
3	MIN	MIN-CORE	23CE2105R	SOLID MECHANICS	R	SMN	3	0	2	0	4	5	
4	MIN	MIN-CORE	23CE2206	STRUCTURAL ANALYSIS	R	STA	3	1	0	0	4	4	
5	MSDC	MIN-SDP	23SDCE01A	VISUALIZATION AND MODELLING FOR STRUCTURAL DESIGN	A	VMSD	0	0	6	4	4	10	

30. MINOR: BIO-MEDICAL ENGINEERING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRBM01	BIOMEDICAL DATA INTEGRATION	R	BMDI	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRBM02	MEDICAL IMAGING	R	MI	3	0	2	0	4	5	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
3	MIN	MIN-CORE	23MRBM03	PHARMACEUTICAL ENGINEERING	R	PME	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRBM04	REGENERATIVE MEDICINE	R	RM	3	0	2	0	4	5	

31. MINOR: CLINICAL RESEARCH

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRCR01	INTRODUCTION CLINICAL RESEARCH	R	ICR	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRCR02	CLINICAL TRAIL MANAGEMENT	R	CTM	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRCR03	ETHICS IN CLINICAL RESEARCH	R	ECR	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRCR04	PRECISION MEDICINE	R	PM	4	0	0	0	4	4	

32. MINOR: BIO-MEDICAL INFORMATICS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23MRBI01	BIOINFORMATICS	R	BI	3	0	2	0	4	5	
2	MIN	MIN-CORE	23MRBI02	BIOSTATISTICS AND DATA ANALYSIS	R	BDA	3	0	2	0	4	5	
3	MIN	MIN-CORE	23MRBI03	HEALTH INFORMATION SYSTEMS	R	HIS	3	0	2	0	4	5	
4	MIN	MIN-CORE	23MRBI04	BIOMEDICAL DATA INTEGRATION	R	BDI	3	0	2	0	4	5	

33. MINOR: COMPUTER SCIENCE

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CS2104R	OPERATING SYSTEMS	R	OS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	R	CTSD	3	0	2	4	5	9	
3	MIN	MIN-CORE	24SC1203	DATA STRUCTURES	R	DS	3	0	2	4	5	9	
4	MIN	MIN-CORE	23EC1202	DIGITAL DESIGN & COMPUTER ARCHITECTURE	R	DDCA	3	0	2	0	4	5	
5	MIN	MIN-CORE	24MT1002	DISCRETE MATHEMATICS	R	DMS	2	2	0	0	4	4	
6	MSDC	MIN-SDP	23SDCS12A	FULL STACK APPLICATION DEVELOPMENT	A	FSD	0	0	6	4	4	10	

34. MINOR: CYBER SECURITY AND FORENSICS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CSB3101R	CRYPT ANALYSIS & CYBER DEFENSE	R	CACD	3	0	2	4	5	9	
2	MIN	MIN-CORE	23CSB3202R	NETWORK AND INFRASTRUCTURE SECURITY	R	NIS	3	0	0	0	3	3	
3	MIN	MIN-CORE	23CSB3304R	DIGITAL FORENSICS	R	DF	3	0	2	4	5	9	
4	MIN	MIN-CORE	23AD2102R	DATABASE MANAGEMENT SYSTEMS	R	DBMS	3	0	2	0	4	5	
5	MSDC	MIN-SDP	23SDCS05A	CLOUD BASED SECURITY SPECIALITY	A	CBSS	0	0	6	4	4	10	

35. MINOR: UX DESIGN

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CS2104R	OPERATING SYSTEMS	R	OS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23GDU3101R	PROGRAMMING FOR GAME DEVELOPMENT	R	PGD	3	0	2	4	5	9	
3	MIN	MIN-CORE	23GDU3303R	AR & VR APPLICATION DEVELOPMENT	R	AR&VR	3	0	2	4	5	9	
4	MIN	MIN-CORE	23GDU3506	PRINCIPLES OF GAME DESIGN	R	PRGD	3	0	0	0	3	3	
5	MSDC	MIN-SDP	23SDCS06A	CERTIFIED GAME DEVELOPER	A	CGD	0	0	6	4	4	10	

36. MINOR: BLOCKCHAIN AND CRYPTOCURRENCIES

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CSB3203R	INTRODUCTION TO BLOCKCHAIN AND CRYPTO CURRENCIES	R	IBCC	2	0	2	0	3	4	
2	MIN	MIN-CORE	23CSB3304R	DIGITAL FORENSICS	R	DF	3	0	2	4	5	9	
3	MIN	MIN-CORE	23CSB3405M	DATABASE SYSTEM AND SECURITY	M	DSS	3	0	0	0	3	3	
4	MIN	MIN-CORE	23CSB3406M	PROGRAMMING FOR SMART CONTRACTS	M	PSC	3	0	0	0	3	3	
5	MIN	MIN-CORE	23CSB3510	SECURITY GOVERNANCE & MANAGEMENT	R	SGM	3	0	0	0	3	3	
6	MSDC	MIN-SDP	23SDCS05A	CLOUD BASED SECURITY SPECIALITY	A	CBSS	0	0	6	4	4	10	

37. MINOR: GAME DEVELOPMENT

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CS2104R	OPERATING SYSTEMS	R	OS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	R	CTSD	3	0	2	4	5	9	
3	MIN	MIN-CORE	23GDU3101R	PROGRAMMING FOR GAME DEVELOPMENT	R	PGD	3	0	2	4	5	9	
4	MIN	MIN-CORE	24SC2105R	COMPUTATIONAL THINKING FOR OBJECT-ORIENTED DESIGN	R	CTOD	3	0	2	4	5	9	
5	MSDC	MIN-SDP	23SDCS06A	CERTIFIED GAME DEVELOPER	A	CGD	0	0	6	4	4	10	

38. MINOR: SMART GRID AUTOMATION

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23EE2226F	ELECTRICAL TECHNOLOGY	F	ET	2	0	2	0	3	4	
2	MIN	MIN-CORE	23SGT3101R	DISTRIBUTED ENERGY RESOURCES AND SMART GRIDS	R	DERSG	3	0	2	4	5	9	
3	MIN	MIN-CORE	23SGT3406M	SMART METERS AND SMART CITIES	M	SMSC	3	0	0	0	3	3	
4	MIN	MIN-CORE	23SGT3507	INTERNET OF THINGS AND SMART GRID ANALYTICS	R	IOT&SGA	3	0	0	0	3	3	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
5	MIN	MIN-CORE	23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	R	BEEC	2	0	0	0	2	2	
6	MSDC	MIN-SDP	23SDEE04A	AI & ML FOR SMART GRIDS	A	AIMLSG	0	0	6	4	4	10	

39. MINOR: COMMUNICATIONS AND NETWORKING

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CCF3101R	TCP/IP & OTHER PROTOCOL SUITE	R	TCP	3	0	2	4	5	9	
2	MIN	MIN-CORE	23EC2210R	NETWORK PROTOCOLS AND SECURITY	R	NPS	3	0	2	0	4	5	
3	MIN	MIN-CORE	23EC1202	DIGITAL DESIGN & COMPUTER ARCHITECTURE	R	DDCA	3	0	2	0	4	5	
4	MIN	MIN-CORE	23EC2235F	RESILIENT NETWORKS	F	RNW	2	0	2	0	3	4	
5	MSDC	MIN-SDP	23SDEC01A	ELECTRONIC SYSTEM DESIGN	A	ESD	0	0	6	4	4	10	

40. MINOR: ROBOTICS AND AUTOMATION

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23EC2105R	SIGNALS & COMMUNICATION SYSTEMS	R	SCS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23EC2106R	PROCESSORS AND CONTROLLERS	R	PRC	3	0	2	0	4	5	
3	MIN	MIN-CORE	23EC2223F	FUNDAMENTALS OF ROBOTICS	F	FOR	2	0	2	0	3	4	
4	MIN	MIN-CORE	23EE2207R	CONTROL SYSTEMS	R	CS	3	0	2	0	4	5	
5	MIN	MIN-CORE	23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	R	BEEC	2	0	0	0	2	2	
6	MIN	MIN-CORE	24EC1101	FUNDAMENTALS OF IOT AND SENSORS	R	FIS	2	0	4	0	4	6	
7	MSDC	MIN-SDP	23SDEC01A	ELECTRONIC SYSTEM DESIGN	A	ESD	0	0	6	4	4	10	

41. DOUBLE MAJOR: SECOND MAJOR CSE FOR FIRST MAJOR BBA / B.COM / BSC / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CS2104R	OPERATING SYSTEMS	R	OS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23CS2205R	DESIGN AND ANALYSIS OF ALGORITHMS	R	DAA	3	0	2	4	5	9	
3	MIN	MIN-CORE	23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	R	CTSD	3	0	2	4	5	9	
4	MIN	MIN-CORE	24SC1203	DATA STRUCTURES	R	DS	3	0	2	4	5	9	
5	MIN	MIN-CORE	23EC2210R	NETWORK PROTOCOLS AND SECURITY	R	NPS	3	0	2	0	4	5	
6	MIN	MIN-CORE	23AD2102R	DATABASE MANAGEMENT SYSTEMS	R	DBMS	3	0	2	0	4	5	
7	MIN	MIN-CORE	23CI2001	ADAPTIVE SOFTWARE ENGINEERING	R	ASE	3	1	0	0	4	4	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
8	MIN	MIN-CORE	24SC2105R	COMPUTATIONAL THINKING FOR OBJECT-ORIENTED DESIGN	R	CTOD	3	0	2	4	5	9	
9	MSDC	MIN-SDP	23SDCS12A	FULL STACK APPLICATION DEVELOPMENT	A	FSD	0	0	6	4	4	10	

42. DOUBLE MAJOR: SECOND MAJOR CSIT FOR FIRST MAJOR BBA / B.COM / BSC / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	MIN	MIN-CORE	23CS2104R	OPERATING SYSTEMS	R	OS	3	0	2	0	4	5	
2	MIN	MIN-CORE	23CS2205R	DESIGN AND ANALYSIS OF ALGORITHMS	R	DAA	3	0	2	4	5	9	
3	MIN	MIN-CORE	23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	R	CTSD	3	0	2	4	5	9	
4	MIN	MIN-CORE	24SC1203	DATA STRUCTURES	R	DS	3	0	2	4	5	9	
5	MIN	MIN-CORE	23EC2210R	NETWORK PROTOCOLS AND SECURITY	R	NPS	3	0	2	0	4	5	
6	MIN	MIN-CORE	23AD2102R	DATABASE MANAGEMENT SYSTEMS	R	DBMS	3	0	2	0	4	5	
7	MIN	MIN-CORE	23CI2001	ADAPTIVE SOFTWARE ENGINEERING	R	ASE	3	1	0	0	4	4	
8	MIN	MIN-CORE	24SC2105R	COMPUTATIONAL THINKING FOR OBJECT-ORIENTED DESIGN	R	CTOD	3	0	2	4	5	9	
9	MSDC	MIN-SDP	23SDCS12A	FULL STACK APPLICATION DEVELOPMENT	A	FSD	0	0	6	4	4	10	
10	SMFC	SMFC-CORE	23CI2203	MANAGEMENT INFORMATION SYSTEM - ERP	R	MIS	2	0	0	0	2	2	

43. DOUBLE MAJOR: SECOND MAJOR EEE FOR FIRST MAJOR BBA / B.COM / BSC / BCA / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	23OEEE03	ELECTRICAL POWER ENGINEERING	R	EPE	4	0	0	0	4	4	
2	MIN	MIN-CORE	23EC2106R	PROCESSORS AND CONTROLLERS	R	PRC	3	0	2	0	4	5	
3	MIN	MIN-CORE	23EE2207R	CONTROL SYSTEMS	R	CS	3	0	2	0	4	5	
4	MIN	MIN-CORE	23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	R	BEEC	2	0	0	0	2	2	
5	SMFC	SMFC-	23EE2102R	ELECTRICAL MACHINES	R	ELM	3	0	2	0	4	5	
6	SMFC	SMFC-CORE	23EE2204R	ELECTRICAL POWER GENERATION, TRANSMISSION & DISTRIBUTION	R	EPGTD	2	1	0	0	3	3	
7	SMFC	SMFC-	23EE2225F	POWER QUALITY	F	PQ	3	0	0	0	3	3	
8	SMFC	SMFC-CORE	23EE3208R	POWER SYSTEM PROTECTION & CONTROL	R	PSPC	2	0	2	2	3.5	6	
9	SMFC	SMFC-	23EE2101	ELECTRICAL CIRCUITS	R	ELC	2	0	2	0	3	4	
10	SMFC	SMFC-	23EE2205R	POWER ELECTRONICS	R	PES	3	0	2	0	4	5	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
11	SMFC	SMFC-SDP	23SDEE01A	VISUALIZATION AND MODELING OF CIRCUITS	A	VAMC	0	0	6	4	4	10	

44. DOUBLE MAJOR: SECOND MAJOR ECE FOR FIRST MAJOR CIVIL / BBA / B.COM / BSC / BCA / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	23EC2211R	VLSI DESIGN	R	VLSID	3	0	2	2	4.5	7	
2	OEC	OE-2	23EC2208R	DIGITAL COMMUNICATION	R	DC	3	0	2	0	4	5	
3	MIN	MIN-CORE	23EC2210R	NETWORK PROTOCOLS AND SECURITY	R	NPS	3	0	2	0	4	5	
4	MIN	MIN-CORE	23EC2105R	SIGNALS & COMMUNICATION SYSTEMS	R	SCS	3	0	2	0	4	5	
5	MIN	MIN-CORE	23EC2106R	PROCESSORS AND CONTROLLERS	R	PRC	3	0	2	0	4	5	
6	MIN	MIN-CORE	23EC3112R	DISCRETE TIME SIGNAL PROCESSING	R	DTSP	3	0	2	0	4	5	
7	MIN	MIN-CORE	23EC1202	DIGITAL DESIGN & COMPUTER ARCHITECTURE	R	DDCA	3	0	2	0	4	5	
8	MIN	MIN-CORE	23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	R	BEEC	2	0	0	0	2	2	
9	MIN	MIN-CORE	24EC1101	FUNDAMENTALS OF IOT AND SENSORS	R	FIS	2	0	4	0	4	6	
10	MSDC	MIN-SDP	23SDEC01A	ELECTRONIC SYSTEM DESIGN	A	ESD	0	0	6	4	4	10	
11	SMFC	SMFC-	23EC2226F	WIRELESS COMMUNICATIONS	F	WC	2	0	2	0	3	4	
12	SMFC	SMFC-CORE	23EC2209R	ELECTROMAGNETIC WAVES & TRANSMISSION LINES	R	EMWTL	3	0	0	0	3	3	
13	SMFC	SMFC-CORE	23EC2104R	ANALOG ELECTRONIC CIRCUIT DESIGN	R	AECD	3	0	2	2	4.5	7	

45. DOUBLE MAJOR: SECOND MAJOR IOT FOR FIRST MAJOR BBA / B.COM / BSC / BCA / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	23IN2102	ELECTRONIC DEVICES AND INTEGRATED CIRCUITS	R	EDAIC	3	0	2	0	4	5	
2	OEC	OE-2	23IN2203	WIRELESS TECHNOLOGIES FOR IOT	R	WTIOT	3	0	2	0	4	5	
3	MIN	MIN-CORE	23EC2210R	NETWORK PROTOCOLS AND SECURITY	R	NPS	3	0	2	0	4	5	
4	MIN	MIN-CORE	23EC2106R	PROCESSORS AND CONTROLLERS	R	PRC	3	0	2	0	4	5	
5	MIN	MIN-CORE	23EC1202	DIGITAL DESIGN & COMPUTER ARCHITECTURE	R	DDCA	3	0	2	0	4	5	
6	MIN	MIN-CORE	24EC1101	FUNDAMENTALS OF IOT AND SENSORS	R	FIS	2	0	4	0	4	6	
7	SMFC	SMFC-	23IN2101R	IOT SYSTEM DESIGN	R	IOTPA	3	0	2	0	4	5	
8	SMFC	SMFC-	23IN3104R	REAL TIME OPERATING SYSTEMS	R	RTOS	3	0	2	0	4	5	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
9	SMFC	SMFC-	23IN3105R	EMBEDDED SYSTEMS DESIGN	R	ESD	2	0	2	0	3	4	
10	SMFC	SMFC-SDP	23SDIN01A	IOT HARDWARE PROGRAMMING	A	IOTHP	0	0	6	4	4	10	

46. DOUBLE MAJOR: SECOND MAJOR AIDS FOR FIRST MAJOR ECE / IOT / CSE / CSIT

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	23AD2204R	DATA MANAGEMENT AND WAREHOUSING	R	DMW	3	0	2	0	4	5	
2	OEC	OE-2	23AD3106R	BIG DATA ENGINEERING	R	BDE	3	0	2	0	4	5	
3	SMFC	SMFC-CORE	23AD01HF	MACHINE LEARNING FOR HEALTHCARE	R	MLH	3	0	2	0	4	5	
4	SMFC	SMFC-	23AD03HF	REINFORCEMENT LEARNING	R	RIL	3	0	2	0	4	5	
5	SMFC	SMFC-	23AD04HF	EXPLAINABLE AI	R	EAI	3	0	2	0	4	5	
6	SMFC	SMFC-	23AD2205R	DEEP LEARNING	R	DL	3	0	2	4	5	9	
7	SMFC	SMFC-	23AD3207R	NATURAL LANGUAGE PROCESSING	R	NLP	3	0	2	0	4	5	
8	SMFC	SMFC-CORE	23AD4108	ETHICS FOR ARTIFICIAL INTELLIGENCE	R	EAI	1	0	0	0	1	1	
9	SMFC	SMFC-CORE	23AD2103R	SYSTEM DESIGN & INTRODUCTION TO CLOUD	R	SDC	3	0	2	0	4	5	
10	SMFC	SMFC-CORE	23AD02HF	DATA ENGINEERING AND ARCHITECTURE	R	DEA	3	0	2	0	4	5	

47. DOUBLE MAJOR: SECOND MAJOR ME FOR FIRST MAJOR BBA / B.COM / BSC / BCA / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	23ME2106R	MECHANICS OF SOLIDS	R	MOS	3	0	2	0	4	5	
2	OEC	OE-2	23ME2116	FLUID MECHANICS & HYDRAULIC MACHINES	R	FMHM	3	0	2	0	4	5	
3	MIN	MIN-CORE	23ME1001R	ENGINEERING MECHANICS	R	EM	3	0	0	0	3	3	
4	SMFC	SMFC-	23ME2107R	THERMODYNAMICS	R	TD	3	0	0	0	3	3	
5	SMFC	SMFC-	23ME3110R	HEAT TRANSFER	R	HT	3	0	2	0	4	5	
6	SMFC	SMFC-	23ME1002	ENGINEERING GRAPHICS	R	EG	0	0	4	0	2	4	
7	SMFC	SMFC-CORE	23ME2209R	KINEMATICS & DYNAMICS OF MACHINES	R	KDOM	3	1	2	0	5	6	
8	SMFC	SMFC-	23ME3111R	MECHANICAL ENGINEERING DESIGN	R	MED	3	0	0	0	3	3	
9	SMFC	SMFC-CORE	23ME1004	WORKSHOP PRACTICES FOR ENGINEERS	R	WPE	0	0	4	0	2	4	
10	SMFC	SMFC-	23ME2208	MANUFACTURING PROCESSES	R	MP	3	0	2	0	4	5	
11	SMFC	SMFC-	23ME3113R	MANUFACTURING TECHNOLOGY	R	MT	2	0	2	0	3	4	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
12	SMFC	SMFC-SDP	23SDME01A	VISUALIZATION AND MODELLING FOR ENGINEERING DESIGN	A	VMED	0	0	6	4	4	10	

48. DOUBLE MAJOR: SECOND MAJOR BT FOR FIRST MAJOR B.TECH / BBA / B.COM / BSC / BCA / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	23BT2209R	BIOCHEMICAL REACTION ENGINEERING	R	BCRE	3	0	2	0	4	5	
2	OEC	OE-2	23BT3212	PLANT AND ANIMAL BIOTECHNOLOGY	R	PABT	3	0	2	0	4	5	
3	MSDC	MIN-SDP	23SDBT01A	MEDICAL LAB TECHNOLOGY	A	MLT	0	0	6	4	4	10	
4	SMFC	SMFC-	23BT2104	MICROBIOLOGY	R	MBG	3	0	2	0	4	5	
5	SMFC	SMFC-	23BT2215	PROCESS ENGINEERING PRINCIPLES	R	PEP	2	0	2	0	3	4	
6	SMFC	SMFC-	23BT2224F	BIOREACTOR OPERATIONS	F	BO	2	0	2	0	3	4	
7	SMFC	SMFC-	23BT3213R	DOWNSTREAM PROCESSING	R	DSP	2	0	4	0	4	6	
8	SMFC	SMFC-	23BT3214	BIOINFORMATICS	R	BI	2	0	2	0	3	4	
9	SMFC	SMFC-	23BT1101	CELL BIOLOGY	R	CB	3	0	0	0	3	3	
10	SMFC	SMFC-	23BT2103R	BIOCHEMISTRY	R	BCM	3	0	2	0	4	5	
11	SMFC	SMFC-	23BT2105R	IMMUNOLOGY	R	IMM	3	0	2	0	4	5	
12	SMFC	SMFC-	23BT2206	MOLECULAR BIOLOGY	R	MBY	3	0	0	0	3	3	

49. DOUBLE MAJOR: SECOND MAJOR ANIMATION AND GAMING FOR FIRST MAJOR B.TECH / BBA / B.COM / BSC / BCA / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	24AG1104	GRAPHIC DESIGN	R	GDS	2	0	4	0	4	6	
2	OEC	OE-2	24AG2108A	ADVERTISING AND PUBLIC RELATIONS	A	APR	4	0	0	0	4	4	
3	SMFC	SMFC-	24AG1102	FILM AESTHETICS	R	FAS	2	1	0	0	3	3	
4	SMFC	SMFC-	24AG1103	DRAWING BASICS	R	DBS	2	0	2	0	3	4	
5	SMFC	SMFC-	24AG1205A	DIGITAL MEDIA DESIGN	A	DMG	2	0	6	0	5	8	
6	SMFC	SMFC-	24AG1206	VISUAL ANALYSIS TOOLS	R	VAT	2	1	0	0	3	3	
7	SMFC	SMFC-	24AG1207A	MATTE PAINTING	A	MPT	2	0	6	0	5	8	
8	SMFC	SMFC-	24AG2109A	SOUND DESIGN	A	SDS	0	2	6	0	5	8	
9	SMFC	SMFC-CORE	24AG2210A	MEDIA MANAGEMENT AND ENTREPREUNERSHIP	A	MME	4	0	0	0	4	4	
10	SMFC	SMFC-	24AG2211A	POST PRODUCTION TOOLS	A	PPT	0	0	8	0	4	8	
11	SMFC	SMFC-SDP	24SDAG03	DIGITAL ART	R	DTA	0	0	4	4	3	8	

50. DOUBLE MAJOR: SECOND MAJOR BUSINESS ADMINISTRATION FOR FIRST MAJOR B.TECH / B.COM / BSC / BCA / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	24BB1206R	MARKETING MANAGEMENT	R	MM	3	0	2	0	4	5	
2	OEC	OE-2	24BB2107R	FOUNDATIONS OF FINANCIAL MANAGEMENT	R	FM	3	0	2	0	4	5	
3	SMFC	SMFC-	24BB1101R	MANAGERIAL ECONOMICS	R	ME	3	0	2	0	4	5	
4	SMFC	SMFC-	24BB1102R	PERSPECTIVES OF MANAGEMENT	R	POM	3	0	2	0	4	5	
5	SMFC	SMFC-	24BB1103R	BUSINESS ENVIRONMENT	R	BE	3	0	2	0	4	5	
6	SMFC	SMFC-	24BB1204R	ORGANIZATIONAL BEHAVIOUR	R	OB	3	0	2	0	4	5	
7	SMFC	SMFC-	24BB1205R	HUMAN RESOURCE MANAGEMENT	R	HRM	3	0	2	0	4	5	
8	SMFC	SMFC-CORE	24BB2108R	FUNDAMENTALS OF DIGITAL MARKETING	R	DM	3	0	2	0	4	5	
9	SMFC	SMFC-CORE	24BB2109R	PRODUCTION & OPERATIONS MANAGEMENT	R	PROM	3	0	2	0	4	5	
10	SMFC	SMFC-SDP	24SDBB01A	IT FOR BUSINESS MANAGERS & MIS	A	ITBM	2	0	0	8	4	10	

51. DOUBLE MAJOR: SECOND MAJOR COMPUTER APPLICATIONS FOR FIRST MAJOR B.COM / BBA / BSC / BA

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	OEC	OE-1	24CA2108R	COMPUTER NETWORKS	R	CN	3	1	0	0	4	4	
2	OEC	OE-2	24CA2210	SOFTWARE ENGINEERING	R	SE	3	1	0	0	4	4	
3	SMFC	SMFC-	24CA1101	COMPUTER ORGANIZATION	R	CO	2	2	0	0	4	4	
4	SMFC	SMFC-CORE	24CA1102	ESSENTIALS OF INFORMATION TECHNOLOGY	R	EIT	3	0	2	0	4	5	
5	SMFC	SMFC-CORE	24CA1103R	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	R	CTSD	3	0	2	0	4	5	
6	SMFC	SMFC-	24CA1204R	ESSENTIALS OF OPERATING SYSTEM	R	EOS	3	1	0	0	4	4	
7	SMFC	SMFC-	24CA1205R	DATA STRUCTURES	R	DS	3	0	2	0	4	5	
8	SMFC	SMFC-	24CA1206R	DATABASE MANAGEMENT SYSTEMS	R	DBMS	3	0	2	0	4	5	
9	SMFC	SMFC-CORE	24CA2107R	DESIGN AND ANALYSIS OF ALGORITHMS	R	DAA	3	1	0	0	4	4	
10	SMFC	SMFC-	24SDCA03A	WEB DEVELOPMENT USING PYTHON	A	WDP	2	0	2	4	4	8	

52. SPECIALIZATION: ECONOMICS

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
1	SDC	SDP-1	24SDBA05	ECONOMIC GEOGRAPHY	R	EG	0	0	2	4	2	6	
2	PEC	PE-3	24BA2111R	INTERNATIONAL ECONOMICS AND FINANCE	R	IEF	2	1	0	4	4	7	
3	PEC	PE-3	24BA2112R	INDUSTRIAL ECONOMICS	R	IE	2	1	0	4	4	7	

S#	Cat	Sub-Cat	CourseCode	Course Title	Mode	Acrym	L	T	P	S	CR	CH	Pre-req
4	PEC	PE-3	24BA3227	ECONOMICS AND DATA ANALYTICS	R	EDA	2	1	0	4	4	7	

Program Articulation Matrix

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
1	HAS	23UC0026 - HGP	CO1	Understanding the basic concepts of value education						2		2					
2	HAS	23UC0026 - HGP	CO2	Gain basic understanding of the principles in harmony among the human beings						2		2					
3	HAS	23UC0026 - HGP	CO3	Gain knowledge in the concept of Harmony in the family and society						3		3					
4	HAS	23UC0026 - HGP	CO4	Acquire knowledge in the concepts of harmony in the nature						2		3					
5	HAS	23UC0027 - LAMS	CO1	Understand basic leadership, skills and perspectives and leadership styles									2				
6	HAS	23UC0027 - LAMS	CO2	Understand different managerial skills and apply them to develop high performance teams								3					
7	HAS	23UC0027 - LAMS	CO3	Analyse effective communicative strategies and apply them in team tasks						3							
8	HAS	23UC0027 - LAMS	CO4	Apply strategic planning fundamentals and decision-making techniques, through exercises and case studies		3											
9	HAS	24GN2201 - IS	CO1	Understand the basic concepts related to Internal security.	2				2						2		
10	HAS	24GN2201 - IS	CO2	Understand the Indian security challenges and management in the country.	2			2							2		
11	HAS	24GN2201 - IS	CO3	Analyse the concepts of Organized Crimes, Indian Security Mandate.	3				3						2		
12	HAS	24GN2201 - IS	CO4	Analyse the issues of Money Laundering, Cyber Crimes, and Cyber Security in the society.	3			3							2		
13	HAS	24GN3201 - DM	CO1	Understand of disasters, hazards, risk, and vulnerability, encompassing both natural and man-made phenomena.		2					2					3	

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
14	HAS	24GN3201 - DM	CO2	Understand of earthquakes, floods, droughts, landslides, and their management, with a focus on the specific context of Sikkim and its vulnerability to natural hazards.		3					2					2	
15	HAS	24GN3201 - DM	CO3	Apply the global frameworks for disaster risk reduction, disaster response planning, multi-stakeholder coordination, media engagement, and NDMA guidelines		2			2		2					2	
16	HAS	24GN3201 - DM	CO4	Analyse the critical thinking, and practical skills necessary for effective disaster risk reduction and resilience building in communities and infrastructure.		3			3		2					2	
17	HAS	24UC1103 - LS	CO1	Understand the essential listening, speaking, and reading skills										2			
18	HAS	24UC1103 - LS	CO2	Apply and produce essential writing and non-verbal communication skills										2			
19	HAS	24UC1203 - DTI	CO1	Understand the importance of Design thinking mindset for identifying contextualized problems											1		
20	HAS	24UC1203 - DTI	CO2	Analyze the problem statement by empathizing with user													2
21	HAS	24UC1203 - DTI	CO3	Develop ideation and test the prototypes made		2											
22	HAS	24UC1203 - DTI	CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity									1				
23	HAS	24UC2105 - CS	CO1	To Understand the essential career skills, including resume writing, interview techniques			2										

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
24	HAS	24UC2105 - CS	CO2	Apply a comprehensive understanding of essential team skills, preparing them for successful collaboration and contribution in professional team environments.			2										
25	BSC	24BA1101 - QME	CO1	Understand the solid foundation in mathematical reasoning, proof techniques, and fundamental concepts that are essential for further study in mathematics and related fields.	2											2	
26	BSC	24BA1101 - QME	CO2	Understand the unconstrained and constrained various operations and applications; differentiable functions second and higher order derivatives: properties and applications.			2									2	
27	BSC	24BA1101 - QME	CO3	Analyse the simultaneous equations through Crammer rule and matrix inversion method and identify basic properties of determinants and vectors.			2									2	
28	BSC	24BA1101 - QME	CO4	Analyse the concept The derivative of a function different ability and continuity techniques of differentiation sums, products and quotients of functions composite functions and the chain rule inverse functions implicit differentiation			2										
29	BSC	24BA1101 - QME	CO5	Explain linear difference equations of first and second degree, differentiate between a homogeneous and non-homogeneous difference .			3									2	
30	BSC	24BA2107 - ST	CO1	Understand the key scientific concepts and their applications across different disciplines, from the origins of the universe to the complexities of biological systems.	3		3		2						2		

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
31	BSC	24BA2107 - ST	CO2	Understand of space technology, remote sensing, navigation systems, telemedicine, and defense technologies, equipping them with knowledge and skills relevant to careers in science, technology, engineering, and defense sectors.	3		2		3						2		
32	BSC	24BA2107 - ST	CO3	Apply of energy production, biotechnology, and environmental science, equipping them with the knowledge and skills to address pressing challenges in energy sustainability, pollution control, and biotechnological innovation.	2				2						3		
33	BSC	24BA2107 - ST	CO4	Analyse the skills, critical thinking abilities, and knowledge of current affairs necessary for informed decision-making and civic engagement in science and technology-related issues.	3		3		3						2		
34	PCC	24BA1102 - IME	CO1	Understand the fundamental economic principles, particularly those relating to microeconomics.	2										2		
35	PCC	24BA1102 - IME	CO2	Understand the consumer behavior, market supply, and equilibrium conditions, enabling them to analyze market outcomes and policy interventions in various economic contexts.		2											
36	PCC	24BA1102 - IME	CO3	Apply the different theories of distribution to real-world economic phenomena.	2										3		
37	PCC	24BA1102 - IME	CO4	Aanalyze firm behavior, make production decisions, and assess the efficiency and profitability of production processes.		2											
38	PCC	24BA1102 - IME	CO5	Analyze the features of perfect competition, including a large number of buyers and sellers, homogeneous products, perfect information, and free entry and exit.					3								

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
39	PCC	24BA1103 - PTT	CO1	Understand the political philosophies of the most influential political philosophers of Western world in the Ancient Period	2		2	2							2		
40	PCC	24BA1103 - PTT	CO2	Understand the political philosophies of the most influential political philosophers of Western world in the Medieval Period	2		2	2							2		
41	PCC	24BA1103 - PTT	CO3	Apply the political philosophies of the most influential political philosophers of Western world in the Modern Period	2		2	2							2		
42	PCC	24BA1103 - PTT	CO4	Understand the political philosophies of the most influential political philosophers of India	2		2	2							2		
43	PCC	24BA1103 - PTT	CO5	Analyse the political philosophy influences on social movements in India	2		2	2							2		
44	PCC	24BA1204 - FME	CO1	Understand the nature and scope of macroeconomics and various concepts related to national income.	2											2	
45	PCC	24BA1204 - FME	CO2	Understand the consumption and investment functions.		2											
46	PCC	24BA1204 - FME	CO3	Apply the concept of money and banking framework in India.				2									
47	PCC	24BA1204 - FME	CO4	Analyse he phenomenon of inflation and business cycle in macro economics trend and pattern.				2								2	
48	PCC	24BA1204 - FME	CO5	Analyse he phenomenon of business cycle in macro economics		2											
49	PCC	24BA1205 - MBK	CO1	Understand the Money supply, the Banking system, and Monetary Policy in the Indian context					3					3			

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
50	PCC	24BA1205 - MBK	CO2	Understand the role of financial institutions and their role in economic development of Indian economy.	2												
51	PCC	24BA1205 - MBK	CO3	Apply the appropriate interest rate policy and nterest rate theories in society, in the context of Indian economy.	2											3	
52	PCC	24BA1205 - MBK	CO4	Analyze the functions of the central bank and its monetary policies both at international as well as in India.					3					3			
53	PCC	24BA1205 - MBK	CO5	Analyse the theories of interest rates; Level of Interest Rates: Long and short period rates, Determination; sources of interest rate differentials.	3									3		2	
54	PCC	24BA1206 - IGP	CO1	Understand the basic concepts of Polity and Governance	2	2								3		2	
55	PCC	24BA1206 - IGP	CO2	Understand the knowledge in the Polity and Governance	2	2								3		2	
56	PCC	24BA1206 - IGP	CO3	Apply basic knowledge in the political parties and rights	2	2								3		2	
57	PCC	24BA1206 - IGP	CO4	Analyse the Knowledge in the working of government organs	2	2								3		2	
58	PCC	24BA1206 - IGP	CO5	Analyse the governance at local level	3	2								3		2	
59	PCC	24BA2108R - BE	CO1	Understand the Nature of Econometrics and Economic Data Definition of Econometrics, Steps in Empirical Economic Analysis, Econometric Model.	2									2			

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
60	PCC	24BA2108R - BE	CO2	Understand the two Variable Linear Regression Model: Assumptions, Estimation of Parameters, Tests of Significance and Properties of Estimators, Functional forms of Regression models					3							2	
61	PCC	24BA2108R - BE	CO3	Application of the econometrics identifying the problems like Multicolinearity, Autocorrelation and consquences in simple as well as multiple linear regression models.	2									2			
62	PCC	24BA2108R - BE	CO4	Analyse the data by using testing multiple linear restrictions using the F-test, relationship between F and t statistics, the R-squared form of the F-statistic, and computing p-values for F tests:					3							3	
63	PCC	24BA2108R - BE	CO5	Analyze data and draw valid conclusions in empirical research by studying the hypothesis testing, chi square test, with help of other econometric tools.	3									3			
64	PCC	24BA2109R - AE	CO1	Understand the nature and scope of agriculture economics	2												2
65	PCC	24BA2109R - AE	CO2	Understand the salient features of the major theories of policy impact on agricultural production.	2	2											2
66	PCC	24BA2109R - AE	CO3	Apply the efforts made in policy formulation post independent India in view Green revolution.	2	2											2
67	PCC	24BA2109R - AE	CO4	Apply the major issues in Indian agriculture market and the institutional structures established.	2	2											2

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
68	PCC	24BA2109R - AE	CO5	Apply the major issues in Indian agriculture production and demand		3			2								2
69	PCC	24BA2110R - CP	CO1	Understand the basic concepts of comparative politics	2		3							3		3	
70	PCC	24BA2110R - CP	CO2	Understand basic knowledge in the political theories	2		3							3		3	
71	PCC	24BA2110R - CP	CO3	Apply basic knowledge in the political parties and rights	3		3							3		3	
72	PCC	24BA2110R - CP	CO4	Analyse to acquire Knowledge in the concept of political Institutions	3		3							3		3	
73	PCC	24BA2110R - CP	CO5	Analyse the comparison between national politics	3		3							3		3	
74	PCC	24BA2213R - PF	CO1	Understand the scope of public finance, public goods and MSA and Overview of Fiscal Functions, Tools of Normative Analysis.	2									2			
75	PCC	24BA2213R - PF	CO2	Understand the various principles, cause and effect of public expenditure and Empirical evidence on public expenditure theories.					2							2	
76	PCC	24BA2213R - PF	CO3	Apply the source, types, incidence, effects of taxation along with the recent tax policies in India.	2									3			
77	PCC	24BA2213R - PF	CO4	Analyse the effects of debt and concepts of Government budget.	3				3							3	
78	PCC	24BA2213R - PF	CO5	Fiscal Responsibility and Budget Management Act: An Evaluation. Trends in and Financing pattern of deficits in India and its macro-economic implications.					3					3			

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
79	PCC	24BA2214R - HEC	CO1	Understand the growth equation showing the conditions under which higher growth post independent in India.	2											2	
80	PCC	24BA2214R - HEC	CO2	Understand the trend in the public financing of education in India over the period 1980 s to 2010..		2										2	
81	PCC	24BA2214R - HEC	CO3	Analyse an overview of the early contributors to the concept of human capital.		2										2	
82	PCC	24BA2214R - HEC	CO4	Apply the method of Impact Evaluation for evaluating the benefits from health projects.		2											
83	PCC	24BA2214R - HEC	CO5	Analyse Economic concepts and their potential application in health.		3			2							2	
84	PCC	24BA2214R - HEC	CO6	.Analyses Human Development in India													
85	PCC	24BA2215 - IR	CO1	Understand the concept of International Relations	2		2	2							2		
86	PCC	24BA2215 - IR	CO2	Understand the role of International Organizations	2		2	2							2		
87	PCC	24BA2215 - IR	CO3	Understand the basic structure of Indian foreign policy	2		2	2							2		
88	PCC	24BA2215 - IR	CO4	Apply the factors determinants of Indian foreign policy. .	2		2	2							2		
89	PCC	24BA2215 - IR	CO5	Analyses the significant issues of Indian foreign policy.	2		2	2							2		
90	PCC	24BA2216R - IOIM	CO1	Understand functions and theoretical underpinnings, and evolution of international organization	2			2		2				2		2	

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
91	PCC	24BA2216R - IOIM	CO2	Apply to identify the success as well as drawbacks of League of Nations and United Nations, and assess the working of different UN agencies	2			2		2				2		3	
92	PCC	24BA2216R - IOIM	CO3	Apply the significance, development, functions and legal status of international financial institutions	2			3		2				2		2	
93	PCC	24BA2216R - IOIM	CO4	Analyse the influences on IMF in the international exchange system.	3			2		2				2		2	
94	PCC	24BA2216R - IOIM	CO5	Analyse the role of the WTO in International trade system	2			2		3				2		2	
95	PCC	24BA2216R - IOIM	CO6	Analyse the trend and performance of the global trade.	2			2		2				2		2	
96	PCC	24BA3119R - EGD	CO1	Understand the concept of growth and development and their significance in connection with various economic indicators.	2									2			
97	PCC	24BA3119R - EGD	CO2	Understand the significance of Human resource development which is very essential concept in economics in economic.					3							2	
98	PCC	24BA3119R - EGD	CO3	Apply the economic planning and policy mentioned by different economist. A comprehensive picture they will get after going through these economic theories.	2									3			
99	PCC	24BA3119R - EGD	CO4	Analyse the theories of economic development for the deeper understanding along with its criticism.	3											3	
100	PCC	24BA3119R - EGD	CO5	Analyse how development intersects with environmental sustainability, and be equipped with the knowledge and skills to contribute positively to this field.					3					3		3	

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
101	PCC	24BA3120R - IEPP	CO1	Understand different income and non-income indicators of poverty.	2											2	
102	PCC	24BA3120R - IEPP	CO2	Understand the income and non-income dimensions of poverty in India context .		2										2	
103	PCC	24BA3120R - IEPP	CO3	Apply the factors that condition the nutritional status of children and adults in India.		2										2	
104	PCC	24BA3120R - IEPP	CO4	Apply the persistence of nutrition problem in India in spite of the progress made in poverty reduction.		2											
105	PCC	24BA3120R - IEPP	CO5	Analyses regional disparity in terms of macroeconomic aggregates including growth rate, per capita GDP, et		3			2							2	
106	PCC	24BA3120R - IEPP	CO6	Analyses Public Finance in India													
107	PCC	24BA3121 - DLM	CO1	Understand the key concepts and theories related to the digital labor market.	2				2					2			
108	PCC	24BA3121 - DLM	CO2	Understand the implications of gig economy and remote work on traditional labor markets.					3							3	
109	PCC	24BA3121 - DLM	CO3	Apply the automation and AI in shaping future labor demand and supply and policies and regulations in the context of digital work environments.	3									3			
110	PCC	24BA3121 - DLM	CO4	Analyze the impact of digital technologies on employment and work structures and Develop critical thinking and analytical skills to assess digital labor market trends and issues.					3							3	
111	PCC	24BA3121 - DLM	CO5	Presentation and Communication on the digital labour markets and plaotform workers issues.	3									3		3	
112	PCC	24BA3122R - IFP	CO1	Understand the complexities involved in foreign policymaking of India.	2		2	2							2		

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
113	PCC	24BA3122R - IFP	CO2	Understand the institutional practices involved in foreign policymaking of India	2		2	2							2		
114	PCC	24BA3122R - IFP	CO3	Understand to comprehend the implications of Indian engagement with the world.	2		2	2							2		
115	PCC	24BA3122R - IFP	CO4	Apply the new issues emerging in Indian interactions with other states.	2		2	2							2		
116	PCC	24BA3122R - IFP	CO5	Analyse the new issues emerging in Indian interactions with other states and regional organizations.	2		2	2							2		
117	PCC	24BA3223R - CIIE	CO1	Understand the impact of LPG policies on economic growth in India.	2				3					2			
118	PCC	24BA3223R - CIIE	CO2	Understanding of the intersections between agricultural policy, economic development, and sustainable practices, and be equipped with the knowledge and skills to contribute positively to these fields.					3								2
119	PCC	24BA3223R - CIIE	CO3	Apply various factors influencing business environment, economic policies, fiscal management, and reforms, and be equipped with the knowledge and skills to contribute positively .	3									3			
120	PCC	24BA3223R - CIIE	CO4	Analyze the financial system, regulatory environment, and economic policies in India, and be equipped with the knowledge and skills.					3								3
121	PCC	24BA3223R - CIIE	CO5	Analyse the Indias trade policies, financial reforms, and their impact on the economy, and be equipped with the knowledge and skills to contribute positively to these fields.	3									3			3
122	PCC	24BA3224 - CAE	CO1	Understand the Computer Application in Economic scope and limitations .	2												2

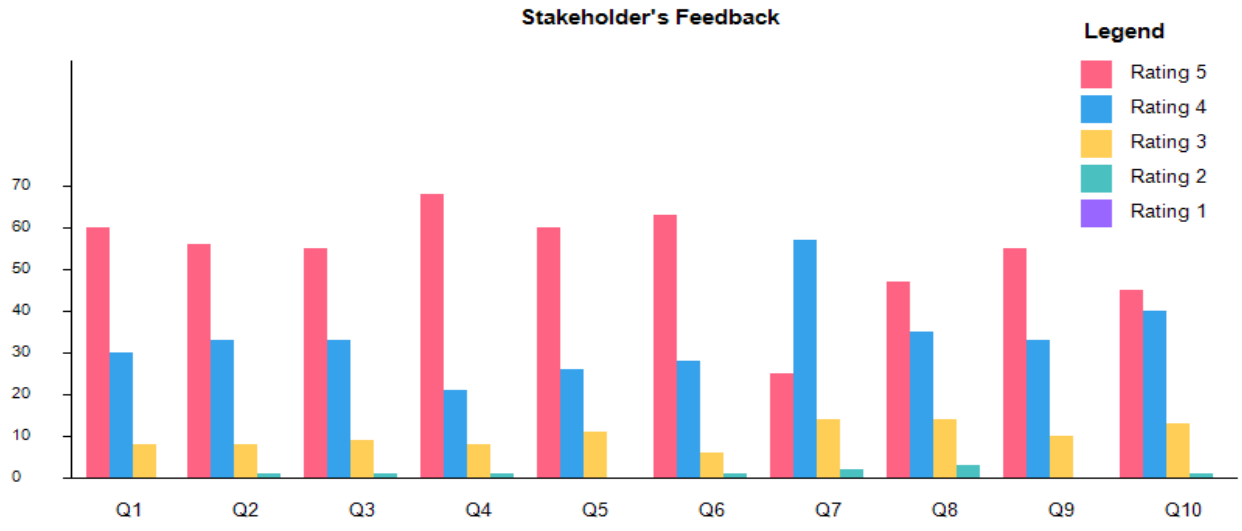
S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
123	PCC	24BA3224 - CAE	CO2	Understand basic components of computer CPU, input and output devices: keyboard, mouse, scanner, VDU, printers, primers plotters.		2											
124	PCC	24BA3224 - CAE	CO3	Apply the computers and their applications, hardware, software and firmware.				2									
125	PCC	24BA3224 - CAE	CO4	Apply the Generations of programming languages and their applications.				2									
126	PCC	24BA3224 - CAE	CO5	Apply the Generations of programming languages and their applications.		2											3
127	PCC	24BA3225 - LG	CO1	Gain basic knowledge in the Local Governance	1		2							3	3	3	
128	PCC	24BA3225 - LG	CO2	Understand the basic concepts of Acts in Governance	1		2							3	3	3	
129	PCC	24BA3225 - LG	CO3	Gain basic knowledge in the rural governance	2		2							3	3	3	
130	PCC	24BA3225 - LG	CO4	Acquire Knowledge in the concept of urban development	2		2							3	3	3	
131	PCC	24BA3225 - LG	CO5	Analyse and Acquire Knowledge in the concept of urban development	2		2							3	3	3	
132	PCC	24BA3226 - PDWIC	CO1	Understand the historical developments that culminated in the drafting of the Indian Constitution	2		2	2							2		
133	PCC	24BA3226 - PDWIC	CO2	Understand the basic features of the Indian Constitution	2		2	2							2		
134	PCC	24BA3226 - PDWIC	CO3	Understand the structure of the Federal Government as defined by the Indian Constitution	2		2	2							2		
135	PCC	24BA3226 - PDWIC	CO4	Apply the Indian Judicial System influences in the transparency of judicial activities.	2		2	2							2		

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
136	PCC	24BA3226 - PDWIC	CO5	Analyse the influences of election commission roles in Indian democracy.	2		2	2							2		
137	PRI	24IE1201 - SIP-1	CO1	To apply various aspects related to initial visit	2										2		
138	PRI	24IE1201 - SIP-1	CO2	To apply various aspects related to interim isit		2										2	
139	PRI	24IE1201 - SIP-1	CO3	To apply various aspects related to final visit			2										2
140	PRI	24IE1201 - SIP-1	CO4	To apply various aspects related to Viva Presentation				2									2
141	SIL	22UC0021 - SIL-1	CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.									2				
142	SIL	22UC0021 - SIL-1	CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.									2				
143	SIL	22UC0021 - SIL-1	CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.									2				
144	SIL	22UC0021 - SIL-1	CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.									2				
145	SIL	22UC0021 - SIL-1	CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.									2				
146	SIL	22UC0022 - SIL-2	CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3			3									

S#	Cat	Course	CO	CO Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
147	SIL	22UC0022 - SIL-2	CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3			3									
148	SIL	22UC0022 - SIL-2	CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3			3									
149	SIL	22UC0022 - SIL-2	CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3			3									
150	SIL	22UC0022 - SIL-2	CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3			3									
151	SIL	22UC0023 - SIL-3	CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3			3									
152	SIL	22UC0023 - SIL-3	CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3			3									
153	SIL	22UC0023 - SIL-3	CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3			3									
154	SIL	22UC0023 - SIL-3	CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3			3									
155	SIL	22UC0023 - SIL-3	CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3			3									
					2.3	2.2	2.2	2.3	2.7	2.3	2	2.6	1.9	2.7	2.2	2.4	2.2

Stakeholder's Feedback

Q#	Question	No. of Stakeholder's						Rating (%)				
		STU	ALU	IE	AP	FAC	TOT	[5]	[4]	[3]	[2]	[1]
Q1	How would you rate the relevance of the current syllabus content in addressing industry needs and trends?	90	33	33	35	129	320	60	30.9	8.8	0.3	0
Q2	How well do the course outcomes align with the skills required in the industry?	90	33	33	35	129	320	56.3	33.8	8.4	1.3	0.3
Q3	How would you rate the inclusion of emerging technologies or methodologies in the syllabus?	90	33	33	35	129	320	55.9	33.4	9.4	1.3	0
Q4	How effectively are the latest tools integrated into the curriculum?	90	33	33	0	0	156	68.6	21.2	8.3	1.9	0
Q5	How beneficial are the global certifications included in the curriculum for industry readiness?	90	33	33	0	129	285	60.4	26.7	11.9	0.7	0.4
Q6	How effectively does the curriculum incorporate practical lab experiments relevant to industry practices?	0	33	33	0	0	66	63.6	28.8	6.1	1.5	0
Q7	How does this curriculum compare with similar curricula at other institutions in terms of content and quality?	0	0	0	35	0	35	25.7	57.1	14.3	2.9	0
Q8	How effective is the integration of research opportunities into the curriculum?	0	0	0	35	129	164	47	35.4	14.6	3	0
Q9	How beneficial were the MOOCs recommended as part of the curriculum?	90	33	0	35	129	287	55.1	33.8	10.8	0.3	0
Q10	How well does the course content map to skill council recommendations?	0	0	33	35	129	197	45.7	40.1	13.2	1	0



Y24: Bachelor of Arts (Economics & Public Policy)

Category: Humanities Arts And Social Sciences (HAS)

23UC0026 - HUMAN VALUES, GENDER EQUALITY & PROFESSIONAL ETHICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23UC0026	HUMAN VALUES, GENDER EQUALITY & PROFESSIONAL ETHICS	HGP	R	2	0	0	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the basic concepts of value education	2	PO6, PO8
CO2	Gain basic understanding of the principles in harmony among the human beings	2	PO6, PO8
CO3	Gain knowledge in the concept of Harmony in the family and society	3	PO6, PO8
CO4	Acquire knowledge in the concepts of harmony in the nature	4	PO6, PO8

Syllabus

Introduction to Human Values Understanding Value, Self-exploration as the Process for identifying Value, Continuous Happiness and Prosperity The Basic Human Aspirations, Right Understanding, Relationship and Physical Facilities, Happiness and Prosperity Current Scenario, Method to fulfil the Basic Human Aspirations Harmony in the Human Being Understanding the Human Being as Coexistence of Self I and Body, Discriminating between the Needs of the Self and the Body, The Body as an Instrument of I, Understand Harmony in the Self I, Harmony of the Self I with the Body.

Understanding Harmony in the Family and Society The Basic Unit of Human Interaction, Values in Human to Human Relationships, Vision for the Universal Human Order Harmony in the Nature Existence Understand Harmony in the Nature, Interconnectedness, Self regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence is Coexistence at All Levels, The Holistic Perception of Harmony in Existence.

What is Gender, and Why Should We Study It? Gender Equality Milestones, The Context Today Socialisation Making Women, Making Men Preparing for Womanhood, Preparing for Manhood, Different Masculinities, Unrecognised and Unaccounted For, Wage Differentials between Women and Men, Women in the Working Environment . Being Boy A Village Boyhood, School Days, College Styles, Ek Ladki Ko Dekha Toh Sexual Harassment SAY NO! Sexual Harassment, Not EveTeasing, Consent and Relationships, Coping with Everyday Harassment Becoming Man A Dangerous Model of Masculinity, Changing Masculinities, Imprints of Masculinity, Mothers, Fathers and Family.

Implications of the Right Understanding a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of Ethical Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models Typical Case Studies, Strategies for Transition towards Valuebased Life and Profession

Reference Books

1. A Foundation Course in Human Values and Professional Ethics , - R R Gaur, R Sangal and G PBagaria,, First Edition, Excel Books., Penguin press.
2. " Seeing like a Feminist", Menon, Nivedita, First Edition, Excel Books. , Zubaan.
3. "The Brave Heart", Rosa Parks, 1, Indian.
4. How the Other Half Dies, Sussan George, First Edition, Penguin Press, Reprinted.

23UC0027 - LEADERSHIP AND MANAGEMENT SKILLS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23UC0027	LEADERSHIP AND MANAGEMENT SKILLS	LAMS	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand basic leadership, skills and perspectives and leadership styles	2	PO9
CO2	Understand different managerial skills and apply them to develop high performance teams	3	PO8
CO3	Analyse effective communicative strategies and apply them in team tasks	3	PO6
CO4	Apply strategic planning fundamentals and decision-making techniques, through exercises and case studies	3	PO2

Syllabus

Fundamentals of Leadership Skills Understanding Leadership and its Importance, Traits and Models/styles of Leadership, Perspectives on Leadership: Bipolarity-Unidimensionality - Bidimensionality-Hierarchical: Management within Leadership - Hierarchical: Leadership within Management, Basic Leadership Skills: Motivation, Teamwork, Negotiation & Networking, Emotional intelligence.

Managerial Skills - Basic Managerial Skills - Planning for effective management, Recruiting and Retaining Talent - Delegation of tasks - Learn to Coordinate, Organising, Building and Leading high-performance Teams

Effective Communication Strategies for Leaders and Managers - Self-Management Skills: Understanding Self-Concept - Developing Self-Awareness -Self-Examination - Self-Regulation, Active Listening and Feedback Techniques, Conflict Management & Conflict Resolution - Negotiation skills, Role-playing and Group activities

Strategic Planning and Decision-Making - Fundamentals of Strategic Planning and Decision-Making - Setting Goals & Objectives for the Organization, Strategic Tools: SWOT, PEST, FORCE FIELD, SCENARIO PLANNING and SIX THINKING HATS, etc., Simulation Exercises and Strategic Planning Case Studies

Reference Books

1. , The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership, Caruso, D. R. and Salovey P, First edition, 2004, JohnWiley & Sons.
2. Training in Interpersonal Skills:Tips for Managing People at work, Stephen P. Robbins, Phillip L. Hunsaker, 6 edition, 2015, Pearson Education.
3. Learning to Lead: A Workbook on Becoming a Leader, Bennis, W.and Goldsmith, J, 4 edition, 2010, Reading, Mass. : Addison-Wesley.
4. Strategic Management: Concepts and Cases, Fred R. David and Forest R. David, 17th Edition, 2017, Pearson.
5. Interpersonal Skills in Organizations, Suzanne de Janasz, Karen Dowd, and Beth Schneider, 6th Edition, 2018, McGraw-Hill Education.
6. Human Resource Management", Gary Dessler and Biju Varkkey, 15th Edition, 2020, Pearson Education.
7. "Leadership: Theory and Practice", Peter G. Northouse, 8th Edition, 2021, SAGE Publications.
8. Case Studies in Strategic Management: A Practical Approach", Sanjay Mohapatra and R. Sridhar, 1st Edition (2012), Pearson Education.
9. Active Listening: Improve Your Ability to Listen and Lead, Center for Creative Leadership , 1st Edition (2012), Center for Creative Leadership.

24GN2201 - INTERNAL SECURITY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24GN2201	INTERNAL SECURITY	IS	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts related to Internal security.	2	PO1, PO5, PSO1
CO2	Understand the Indian security challenges and management in the country.	2	PO1, PO4, PSO1
CO3	Analyse the concepts of Organized Crimes, Indian Security Mandate.	4	PO1, PO5, PSO1
CO4	Analyse the issues of Money Laundering, Cyber Crimes, and Cyber Security in the society.	4	PO1, PO4, PSO1

Syllabus

Internal Security, External Security, Challenges and Threats on Indian Security (Internal), External Security Threats and Challenges, Communal Violence, The Polarity dominance depends Communal Violence.

Terrorism, Insurgency, The Rise of Insurgency in North East India, Left Wing Extremism, Maoist Modus Operandi, and Development and Spread of Extremism

Security Challenges in Indian Boarder Areas, Security Forces and its mandate: Dealing with External Threats, Organized Crimes, Types of Organized Crimes, Linkages Between Organized Crimes and Terrorism, Organized Crime and India

Money Laundering and Black Money, Cyber Crimes, Treats, & Cyber Security, Cyber Security, Types of Cyber Security, Legal frame work, International Cooperation, and Cyber Security, social media and Key Issues.

Reference Books

1 Challenges to Internal Security of India. , Ashok Kumar IPS (2020) , (5th Edition), MG Graw Grill Publication.

2 Internal security , pavneet singh, 5th edition, MG Graw Grill Publication.

3 Internal Security of India and Disaster Management , Sayed Waquar Raza (IPS) , 4th, Oxford University press.

4 Internal Security, M. Karthikeyan, 2nd edition, pearson.

24GN3201 - DISASTER MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24GN3201	DISASTER MANAGEMENT	DM	R	2	0	0	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand of disasters, hazards, risk, and vulnerability, encompassing both natural and man-made phenomena.	2	PO2, PO7, PSO2
CO2	Understand of earthquakes, floods, droughts, landslides, and their management, with a focus on the specific context of Sikkim and its vulnerability to natural hazards.	2	PO2, PO7, PSO2
CO3	Apply the global frameworks for disaster risk reduction, disaster response planning, multi-stakeholder coordination, media engagement, and NDMA guidelines	3	PO2, PO5, PO7, PSO2
CO4	Analyse the critical thinking, and practical skills necessary for effective disaster risk reduction and resilience building in communities and infrastructure.	4	PO2, PO5, PO7, PSO2

Syllabus

Definition and types of disaster: Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires

Study of Important disasters: Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g) Earthquakes, Landside). Social Economics and Environmental impact of disasters.

Global Frameworks for Disaster Risk Reduction, Disaster Response Disaster Response Plan - Role of Multiple Stockholders in Disaster Response, Role of the Media in Disaster Management, Miscellaneous NDMA Guidelines.

Mitigation and Management techniques of Disaster:Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, Building design and construction in highly seismic zones, retrofitting of buildings.

Reference Books

1 Disaster Management, Savindra Singh, 2018, 6th Edition, Pravallika publications.

2 Introduction to International Disaster Management, , Damon, P. Copola, 2015, 2nd Edition, Butterworth Heineman.

3 Disaster management and Risk Reduction, Role of Environmental Knowledge, Gupta A.K., Niar S.S and Chatterjee S. , 2013,1st Edition, Narosa Publishing House.

4 Text book of Disaster Management, A.K. Srivastava , 2021, 1st Edition, SCIENTIFIC PUBLISHERS (INDIA).

24UC1103 - LANGUAGE SKILLS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24UC1103	LANGUAGE SKILLS	LS	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the essential listening, speaking, and reading skills	2	PO10
CO2	Apply and produce essential writing and non-verbal communication skills	3	PO10

Syllabus

Techniques of Effective Listening, Listening and Comprehension Probing Questions, Barriers to Listening. Speaking: Pronunciation, Enunciation, Vocabulary Fluency, Common Errors Reading :Techniques of Effective Reading, Gathering Ideas and Information from a Given Text

WritingWriting: Clearly State the Claims, Avoid Ambiguity, Vagueness, Unwanted Generalizations, and Oversimplification of Issues, provide Background Information, Effectively Argue the Claim, Provide Evidence for the Claims. , Non- verbal Communication

Reference Books

1 On Writing Well: The Classic Guide to Writing Nonfiction, William Zinsser, 1st Edition, 2016, Harper Perennial.

2 Speaking English Effective (English) , Krishna Mohan & N P Singh, 2nd Edition, 2005, Laxmi Publications-New Delhi,.

3 Effective speech, Richard W.Clark,, 1st Edition, 1988, Glencoe Pub..

4 The Ace of Soft skills, Mr. Gopalaswamy Ramesh et alMr. Gopalaswamy Ramesh et al, 1st edition,2010, Pearson Publications.

5 Body Language: How to Read Others' Thoughts by Their Gestur, Allan Pease, 1st Edition, Sheldon Press.

24UC1203 - DESIGN THINKING AND INNOVATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24UC1203	DESIGN THINKING AND INNOVATION	DTI	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the importance of Design thinking mindset for identifying contextualized problems	2	, PSO1
CO2	Analyze the problem statement by empathizing with user	4	, PSO3
CO3	Develop ideation and test the prototypes made	3	PO2
CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity	2	PO9

Syllabus

Introduction to Design Thinking and Innovation: Introduction to design thinking and its principles, Design definitions and stories, desirability, feasibility, viability, mystery, heuristics, algorithm, requirements, patterns, connect, blind spots; Laws of Design Thinking: less is more, last 2% equals 200%, theory of prioritization; Design mind: definitions, 5 forces of growth (SEPIA), 5 frictional forces (DCAFE), 3 capacity levers (VAL), Design thinking for contextualized problem-solving, Incorporating sustainable development goals into design thinking,

Design Thinking Process: Overview of the design thinking process, Design framework (L0); Empathy research: understanding user needs and perspectives, Persona development: creating user profiles; Customer journey mapping: visualizing user experiences, Define phase: asking the right questions and problem statement formulation.

Ideation, Prototyping and Testing: Ideation techniques, brainstorming and generating creative ideas, Identifying patterns and anti-patterns in ideation, Evaluation of ideas using different criteria (10/100/1000 gm): Prototyping and testing: translating ideas into tangible prototypes.

Entrepreneurial Innovation: Introduction to innovation management, Basics of business models and their role in innovation, Financial estimation for innovation projects: Pitch decks: creating persuasive presentations for innovation, Considerations for intellectual property rights (IPR) in innovation.

Reference Books

1 Design Thinking in the Classroom, David Lee, Kindle, Ulysses Press.

2 The Art of Innovation: Lessons in Creativity from IDEO, America, Tom Kelley , Jonathan Littman , Tom Peters, 2001, Doubleday Broadway Publishing, USA.

3 Unmukt- Science and Art of Design Thinking, Arun Jain, 2019, School of Design Thinking.

4 The Design Thinking Play Book, Michael Lewrick, Patrick Link & Larry Leifer, 2018, Wiley Press.

24UC2105 - COMMUNICATION SKILLS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24UC2105	COMMUNICATION SKILLS	CS	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To Understand the essential career skills, including resume writing, interview techniques	2	PO3
CO2	Apply a comprehensive understanding of essential team skills, preparing them for successful collaboration and contribution in professional team environments.	3	PO3

Syllabus

Career Skills

Advanced Communicative Listening & Speaking

Reference Books

1. "Modernize Your Resume: Get Noticed...Get Hired", Wendy Enelow, Louise Kursmark, 2nd Edition, Emerald Career Publishing.
2. Effective speech,, Richard W.Clark,, 1st edition, Glencoe Pub. Co.1988.
3. "Resume Magic: Trade Secrets of a Professional Resume Writer" , Susan Britton Whitcomb, 2nd Edition, JIST WORKS.
4. .The Ace of Soft Skills, Mr. Gopalaswamy Ramesh et al, 1st edition, Pearson publishers, 2010 print..
5. The Wisdom of Teams: Creating the High-Performance Organization", Jon R. Katzenbach, Douglas K. Smith, 1st Edition, Harvard review Business Press.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Basic Science Courses (BSC)

24BA1101 - QUANTITATIVE METHODS IN ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA1101	QUANTITATIVE METHODS IN ECONOMICS	QME	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the solid foundation in mathematical reasoning, proof techniques, and fundamental concepts that are essential for further study in mathematics and related fields.	2	PO1, PSO2
CO2	Understand the unconstrained and constrained various operations and applications; differentiable functions second and higher order derivatives: properties and applications.	2	PO3, PSO2
CO3	Analyse the simultaneous equations through Crammer rule and matrix inversion method and identify basic properties of determinants and vectors.	3	PO3, PSO2
CO4	Analyse the concept The derivative of a function different ability and continuity techniques of differentiation sums, products and quotients of functions composite functions and the chain rule inverse functions implicit differentiation	4	PO3
CO5	Explain linear difference equations of first and second degree, differentiate between a homogeneous and non-homogeneous difference .	4	PO3, PSO2

Syllabus

Elements of logic and proof converse and contra positive, necessary and sufficient conditions proof by contradiction mathematical induction sets and set operations ordered pairs, Cartesian products of sets relations functions, one to one and onto functions, composite functions, the inverse function the real numbers, natural numbers, integers, rational and irrational numbers absolute value and intervals inequalities

Mathematical Methods Graphs; elementary types of functions: quadratic, polynomial, power, exponential, logarithmic; sequences and series: convergence, algebraic properties and applications; continuous functions: characterizations, properties with respect to various operations and applications; differentiable functions: characterizations, properties with respect to various operations and applications; second and higher order derivatives: properties and applications

Geometric properties of functions: convex functions, their characterizations and applications; local and global optima: geometric characterizations, characterizations using calculus and applications.

The derivative of a function different ability and continuity techniques of differentiation sums, products and quotients of functions composite functions and the chain rule inverse functions implicit differentiation, second and higher order derivatives concavity and convexity of functions

Explain linear difference equations of first and second degree, differentiate between a homogeneous and non-homogeneous difference .

Reference Books

1 Mathematics for economists, Carl P. Simon and Lawrence Blume, eDITION 3 , 2014, cambridge university press.

2 An Introduction to Mathematics for Economics, AKIHITO ASANO, Edition11, 1985, Cambridge University Press.

3 MATHEMATICS FOR ECONOMISTS, michael hoy. John Livern , Chris mc konna, Edition 2, 1991, LAXMI PUBLICATIONS (P) LTD.

4 Mathematical Analysis For Economists, Allen,R.G.D., Edition 2, 2015, Macmillan And Company Limited..

24BA2107 - SCIENCE AND TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2107	SCIENCE AND TECHNOLOGY	ST	R	2	1	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the key scientific concepts and their applications across different disciplines, from the origins of the universe to the complexities of biological systems.	2	PO1, PO3, PO5, PSO1
CO2	Understand of space technology, remote sensing, navigation systems, telemedicine, and defense technologies, equipping them with knowledge and skills relevant to careers in science, technology, engineering, and defense sectors.	2	PO1, PO3, PO5, PSO1
CO3	Apply of energy production, biotechnology, and environmental science, equipping them with the knowledge and skills to address pressing challenges in energy sustainability, pollution control, and biotechnological innovation.	3	PO1, PO5, PSO1
CO4	Analyse the skills, critical thinking abilities, and knowledge of current affairs necessary for informed decision-making and civic engagement in science and technology-related issues.	4	PO1, PO3, PO5, PSO1

Syllabus

Institutional structure for science development, The Big Bang Theory, Quantum Mechanics, Four Fundamental Forces of Nature, Laws of Thermodynamics, atoms and molecules, elements, compounds and mixture, Microbes, Cells - Plants vs Animals, Proteins, Amino Acids, Enzymes, Vitamins and Minerals.

Brief history of space technology (India and world), types of satellites, launch vehicles (PSLV and GSLV), Basics of remote sensing and GIS, GPS, telemedicine, development of defense technologies, DRDO, RADAR, Chemical and Biological weapons.

Energy Overview of fossil fuels as coal, crude oil, new technologies to decrease its pollution content, Thermal power plants, Hydroelectric power plants, geothermal energy, nuclear energy, solar energy, Biotechnology bio technology, Its branches, GM crops, BT cotton, Cloning, Stem cells-Applications in agriculture, industry, food, health etc. vermicomposting, Bioinformatics, Biotechnology and environment, air pollution, plume and its behavior, smog, acid rain, water pollution and its impact.

Science and Tech. news (current affairs), government schemes related to health and family welfare, viral diseases and its vaccines, government agencies- Dept of S & T, SEED, NCSTC, NSTEDB, CSIR, SERC, Technology Development Board, National Accreditation Board, NFHS, NSSO, S&T policy after independence.

Reference Books

1 Advancements in Science and Technology, Ashok Matcha, , 2022, 1st Edition, GK Publications.

2 Science And Technology - General Science For Groups And Civils 2021, CH Mohan, 2020, 6th Edition, MC Reddy Publications.

3 Science and Technology for UPSC, Ravi P. Agrahari, 2023, 7th Edition, McGraw Hill.

4 Science Technology & Society, K. Siddhartha , 2015, 1st Edition, Kitab Mahal.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Professional Core Courses (PCC)

24BA1102 - INTRODUCTION TO MICRO ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA1102	INTRODUCTION TO MICRO ECONOMICS	IME	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental economic principles, particularly those relating to microeconomics.	2	PO1, PSO1
CO2	Understand the consumer behavior, market supply, and equilibrium conditions, enabling them to analyze market outcomes and policy interventions in various economic contexts.	2	PO2
CO3	Apply the different theories of distribution to real-world economic phenomena.	3	PO1, PSO1
CO4	Aanalyze firm behavior, make production decisions, and assess the efficiency and profitability of production processes.	4	PO2
CO5	Analyze the features of perfect competition, including a large number of buyers and sellers, homogeneous products, perfect information, and free entry and exit.	4	PO5

Syllabus

Nature, Definition and Scope of Economics, Methodology in Economics, Microeconomics-Scope, Basic concepts in Microeconomics, Micro- Macro Distinction, Scarcity and Choice as an Economic Problem, Utility Analysis, Cardinal and Ordinal Utility, Law of Diminishing Utility, Law of Equi-marginal Utility,Nature of Demand,Law of Demand,Movements and Shifts in Demand Curve,Elasticity of Demand.

Price, Income and Cross Elasticity, Price Line,Indifference Curve, Law of supply,Determinants of supply, Movement and Shifts in Supply Curves, Elasticity of supply Consumer Surplus,Consumers Equilibrium.

Distribution,Marginal Productivity Theory of Distribution,Rent,Scarcity Rent and Quasi Rent,Ricardian Theory of Rent,Types of Wage,Subsistence Theory,Wage Fund Theory,Theories of interest, Classical, Neoclassical and Keynesian theories. Theories of profit, Dynamic theory, Risk and Uncertainty theory, Innovation theory.

Theory of Production and Cost Concept of Production Function,Long Run and Short Run Production,Isoquant,Law of Variable Proportion,Law of Return to Scale,Concepts of Cost,Money, Accounting,Real,Opportunity,Economic,Implicit and Explicit, Short Run, Long Run, Fixed and Variable Costs,Concepts of Total, Average and Marginal Costs. Relationship between Average and Marginal Costs Curves in Short run and Long run,Concepts of revenue,AR, MR, TR; Break,even point.

Market Structure,Features and Types of Markets,Perfect and Imperfect Markets,Perfect Competition,Price and Output Determination,Equilibrium of Firm and Industry Under Perfect Competition,Monopoly, Price and Output Determination Under Monopoly,Monopolistic Competition, Monopolistic Competition Price and Output Determination,Oligopoly,Kinked Demand Curve of Oligopoly

Reference Books

1 Modern Microeconomics, Koutsoyiannis, A, 2nd, 1979, Macmillan.

2 Intermediate Microeconomics: A Modern Approach, Varian, H.R., 5th, 1999, East West Press, New Delhi.

3 Advanced Economic Theory, H.L.Ahuja., 4th, 2017, S Chand and Company Limited, New Delhi..

4 Principles of Economics. , N.George Mankiw., 2nd, 2008, Thompson.

5 Economics. , P.A.Samuelson & W.D.Nordhaus. T, 6th 2018, ata Mac.Graw Hill.

24BA1103 - POLITICAL THEORY AND THOUGHT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA1103	POLITICAL THEORY AND THOUGHT	PTT	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the political philosophies of the most influential political philosophers of Western world in the Ancient Period	2	PO1, PO3, PO4, PSO1
CO2	Understand the political philosophies of the most influential political philosophers of Western world in the Medieval Period	2	PO1, PO3, PO4, PSO1
CO3	Apply the political philosophies of the most influential political philosophers of Western world in the Modern Period	3	PO1, PO3, PO4, PSO1
CO4	Understand the political philosophies of the most influential political philosophers of India	2	PO1, PO3, PO4, PSO1
CO5	Analyse the political philosophy influences on social movements in India	4	PO1, PO3, PO4, PSO1

Syllabus

Ancient Political Thinkers: Socrates, and Plato, Justice, Ideal State, Communism, Education, Philosopher King, Aristotle, Theory of State, Classification of Governments, Comparative Constitutionalism

Medieval and Modern Thinkers: Machiavelli, Separation of Politics and Ethics, Human Nature, and Thomas Hobbes, Social Contract, Individualism, John Locke, Social Contract, Natural Rights, Limited Government, and Jean Jacques Rousseau, Social Contract, General Will.

Utilitarianism & Idealism: Jeremy Bentham, Utilitarianism, J.S Mill, Liberty and Individualism, and Hegel, Dialectics and State, Marxist Theories: Marx: Class and Class Struggle, and Antonio Gramsci, Theory of Hegemony

Indian Political Thinkers: Kautilya, Sapthanga Theory of State, and Swami Vivekananda, Nationalism.

Mahatma Gandhi views on State; Non-violence, Sathayagraha; Cosmopolitanism, and B R Ambedkar, Social Justice.

Reference Books

1 Western Political Thought, O.P. Gauba, 2016, 1st Edition , Mayur Publications.

2 Fifty Great Political Thinkers, Ian Adams, and R.W.Dyson, 1st Edition, 2004, Routledge.

3 Great Political Thinkers: Plato to Present, Ebenstein, 1st Edition, 2007, Sterling Publishers PVT. Ltd., New Delhi ..

4 Political Theory tradition and diversity , Andrew Vincent , 1st Edition, 1997, Cambridge University.

24BA1204 - FUNDAMENTALS OF MACRO-ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA1204	FUNDAMENTALS OF MACRO-ECONOMICS	FME	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the nature and scope of macroeconomics and various concepts related to national income.	2	PO1, PSO2
CO2	Understand the consumption and investment functions.	2	PO2
CO3	Apply the concept of money and banking framework in India.	3	PO4
CO4	Analyse he phenomenon of inflation and business cycle in macro economics trend and pattern.	4	PO4, PSO2
CO5	Analyse he phenomenon of business cycle in macro economics	4	PO2

Syllabus

National Income Meaning Definitions: National Income, GNP & NNP, GDP & NDP, Personal Income (PI), Disposable Income (Di), Per Capita Income (PCI), Real National Income (RNI) Methods of Estimation of National Income (NI) Measurement of National Income in India Recent Trends in National Income

Trade cycles Meaning and definition Phases of a trade cycle Inflation Definition Types of Inflation Causes and effects of inflation Measures to control inflation Inflation and Un Employment Types and Estimates. Philips Curve.

Concept of aggregate consumption Factors influencing consumption functions private vs public consumption- average and marginal property to consumer multiplier concept. Investment Function concept savings function.

Money Meaning, functions and Classification of Money M1, M2, M3, M4, Supply of Money, and Demand for Money Functions of Commercial banks credit creation- credit control methods. Central Banking System, Monitory Policy, Fiscal Policy.

Analyse he phenomenon of business cycle in macro economics

Reference Books

1 Advanced Macroeconomics, David Romer , EDI 3 2010, , McGraw-Hill..

2 Monetary Economics: theories, evidence and policy, Butter worths., David, G Pierce and Peter J Tysome , EDI 2, 2014, McGraw-Hill.

3 Macroeconomics , Stephen Williamson , EDI 1, 1999, Pearson.

4 Advanced Macroeconomics , Devid Romer, EDI1 , 2014, Mcgraw hill Economics.

24BA1205 - MONEY AND BANKING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA1205	MONEY AND BANKING	MBK	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the Money supply, the Banking system, and Monetary Policy in the Indian context	2	PO5, PO10
CO2	Understand the role of financial institutions and their role in economic development of Indian economy.	2	PO1
CO3	Apply the appropriate interest rate policy and nterest rate theories in society, in the context of Indian economy.	3	PO1, PSO2
CO4	Analyze the functions of the central bank and its monetary policies both at international as well as in India.	4	PO5, PO10
CO5	Analyse the theories of interest rates; Level of Interest Rates: Long and short period rates, Determination; sources of interest rate differentials.	4	PO1, PO10, PSO2

Syllabus

Money Supply and Banking System with reference to India definition of money supply in the Indian context (M1, M2, M3 and M4) , Balance sheet of the banking sector and accounting of money supply; balance sheet of the Reserve Bank of India and the accounting interpretation of High powered money; definition of high powered money; the money multiplier theory and balance sheet of commercial banks, sterilization by Central Banks. Indian banking system, changing role and structure; Indian banking sector reforms.

Financial Institutions and Financial Markets Role of financial markets and institutions in economic development, Indian examples. Money and capital markets: organization, structure and reforms in India; role of financial derivatives and other innovations.

Interest Rates Theories of interest rates; Level of Interest Rates: Long and short period rates, Determination; sources of interest rate differentials; theories of term structure of interest rates; spread between lending and deposit rates; administered interest rates, appropriate interest rate policy. interest rates in India.

Central Banking and Monetary Policy Instruments of monetary control with special reference to India; concepts of statutory liquidity ratio(SLR), cash reserve ratio(CRR) and repo rate as instruments of monetary control; monetary management in an open economy; current monetary policy of India, demonetization and its impact on the Indian economy

Banking System, Central Banks, Role, Functions, Credit Control Methods, Monetary Policy, Monetary policy in India, Financial sector reforms in India.

Reference Books

1 Financial Markets and Institutions, F. S. Mishkin and S. G. Eakins, 6th, 2011, Pearson Education.

2 Financial Institutions and Markets, L. M. Bhole and J. Mahukud, 5th, 2009, Tata McGraw Hill.

3 Indian Financial System, M. Y. Khan, 11th, 2019, Tata McGraw Hil.

4 Monetary Planning in India, Gupta, S.B, 1st,1997, Oxford University Press.

24BA1206 - INDIAN GOVERNMENT AND POLITICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA1206	INDIAN GOVERNMENT AND POLITICS	IGP	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts of Polity and Governance	2	PO1, PO2, PO10, PSO2
CO2	Understand the knowledge in the Polity and Governance	2	PO1, PO2, PO10, PSO2
CO3	Apply basic knowledge in the political parties and rights	3	PO1, PO2, PO10, PSO2
CO4	Analyse the Knowledge in the working of government organs	4	PO1, PO2, PO10, PSO2
CO5	Analyse the governance at local level	4	PO1, PO2, PO10, PSO2

Syllabus

Concept of Diversity, Understanding Diversity, Indian scenario, Diversity and discrimination, Difference and Prejudice, Inequality and Discrimination, Striving for Equality, Levels of Government, Laws and the Government, Types of Government, Democratic Governments

An Introduction, Freedom, Equality, Social Justice, Rights, Citizenship, Nationalism, Secularism, Challenges of nation building, Era of one party dominance, Politics of planned development , Indias external relations

The Gram Panchayat, Three Levels of Panchayats, Rural Administration, Rural Livelihoods, Urban Livelihoods, Equality in Indian democracy, Issues of equality in other democracies, Challenge of democracy, State Government, Role of the Government in Health, Working of state government, Gender, womens work and equality

Understanding secularism, parliament and the making of laws, judiciary, social justice and the marginalised, understanding marginalisation, confronting marginalisation, economic presence of the government, public facilities, law and social justice, democracy outcomes of democracy, electoral politics working of institutions

understanding marginalisation, confronting marginalisation, economic presence of the government, public facilities, law and social justice, democracy outcomes of democracy, electoral politics working of institutions

Reference Books

1 NCERT, GoI, 7th edition,2021, NCERT.

2 Indian Polity, Laxmi kanth, 6-2022, Tata Mc Grawhill.

3 Indian Constitution, DD Basu, 6-2021, Agarwal.

4 Public Administration, Laxmi kanth, 9-2020, Tata Mc Grawhill.

24BA2108R - BASICS OF ECONOMETRICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2108R	BASICS OF ECONOMETRICS	BE	R	2	1	0	4	4

Prerequisite

S#	Course Title	Acronym	Rule
1	QUANTITATIVE METHODS IN ECONOMICS	QME	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the Nature of Econometrics and Economic Data Definition of Econometrics, Steps in Empirical Economic Analysis, Econometric Model.	2	PO1, PO10
CO2	Understand the two Variable Linear Regression Model: Assumptions, Estimation of Parameters, Tests of Significance and Properties of Estimators, Functional forms of Regression models	2	PO5, PSO2
CO3	Application of the econometrics identifying the problems like Multicolinearity, Autocorrelation and consquences in simple as well as multiple linear regression models.	3	PO1, PO10
CO4	Analyse the data by using testing multiple linear restrictions using the F-test, relationship between F and t statistics, the R-squared form of the F-statistic, and computing p-values for F tests:	4	PO5, PSO2
CO5	Analyze data and draw valid conclusions in empirical research by studying the hypothesis testing, chi square test, with help of other econometric tools.	4	PO1, PO10

Syllabus

Introduction, Nature of Econometrics and Economic Data Definition of Econometrics, Steps in Empirical Economic Analysis, Econometric Model, The Role of Measurement in Economics, The Structure of Economic Data: Cross-Sectional data, Time Series data, Pooled Cross Section data, Panel Data. Classical Linear Regression Model.

Introduction, Nature and scope of Econometrics, Definition of the Simple regression Model, Simple Regression Model Two Variable Linear Regression Model: Assumptions, Estimation of Parameters, Tests of Significance and Properties of Estimators, Functional forms of Regression models, Loglinear models, Semi log- models and Reciprocal models, Choice of Functional Form.

Econometric Problems, Multicollinearity- Nature, consequences, detection and remedial measures, Autocorrelation, Nature, consequences, detection, and remedial measures Heteroskedasticity, Nature, consequences, detection and remedial measures.

Inference; Introduction, Sampling Distribution of the OL:S Estimators, Testing Hypotheses about a Single Population parameter: The t Test, Confidence Intervals, Testing Hypotheses about a Single Linear Combination of the Parameters, Testing Multiple Linear Restrictions.

The F Test, Relationship between F and t Statistics, The R-Squared Form of the F Statistic, Computing p-Values for F Tests, The F Statistic for Overall Significance of a Regression, Testing General Linear Restrictions; Reporting Regression Results, Summary.

Reference Books

1 Basic Econometrics, Gujarati, Damodar, 4e, 2007, McGraw-Hill.

2 Introduction to Econometrics, Maddala, G. S., 1e, 1992, Macmillan Publishing Company.

3 Introductory Econometrics for Finance, Brooks Chris, 1e, 2008, Cambridge University Press.

4 Introduction to Econometrics: Principles and Applications, G.M.K. Madnani, 8e, 2015, Paperback.

5 Introduction to Econometrics: A modern Approach, Jeffery M.Wooldridge, 7e, 2012, Thampson.

24BA2109R - AGRICULTURAL ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2109R	AGRICULTURAL ECONOMICS	AE	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the nature and scope of agriculture economics	2	PO1, PSO3
CO2	Understand the salient features of the major theories of policy impact on agricultural production.	2	PO1, PO2, PSO3
CO3	Apply the efforts made in policy formulation post independent India in view Green revolution.	3	PO1, PO2, PSO3
CO4	Apply the major issues in Indian agriculture market and the institutional structures established.	3	PO1, PO2, PSO3
CO5	Apply the major issues in Indian agriculture production and demand	3	PO2, PO5, PSO3

Syllabus

Agricultural Policies, Institutions And Reforms , Theory of Policy Making, Issues in Indian Agriculture, Agrarian Reforms, R& D in Agriculture, Output and Productivity Versus Technology, Farm-Size Productivity Debate,

Issues in Agricultural Finance, Capital Requirements for Modernising Agriculture, Steps Towards Future Policy, Institutions for Growth and Sustainability, Impact of Globalisation on Indian Agriculture, Three Distinct View Points.

Introduction Agricultural Marketing System, Classification of Agricultural Markets, Marketing Channels, Competition in Markets, Marketed Versus Marketable Surplus, State Intervention in Agricultural Marketing.

Introduction, Agricultural Production, Resource Use Efficiency, Factor Combination and Resource Substitution, Cost and Supply Curves, Size of Farm and Laws of Returns, Farm Budgeting and Costs, Supply Response of Individual Crops and Aggregate Supply, Resource Use Efficiency in Traditional Agriculture, Technical Change

Factor Combination and Resource Substitution, Cost and Supply Curves, Size of Farm and Laws of Returns, Farm Budgeting and Costs, Agrarian Reforms, R& D in Agriculture, Output and Productivity Versus Technology, Farm-Size Productivity Debate,

Reference Books

1 Choice of Techniques: An Aspect of The Theory of Planned Economic Development, , Sen, A. K. (1960),, Edition 2, 1960, Basil Blackwell, Oxford..

2 Agrarian Structure and Productivity in Developing Countries, , Berry, R A and W R Cline (1979), , Edition 3, 1992, John Hopkins University Press, Baltimore. .

3 Indian Economy, , S. K. Mishra and V.K. Puri , Edition 2, 2014, Himalaya Publishing House.

4 Indian Economy, Uma Kapila , edition 3, 2015, , Academic Foundation. .

24BA2110R - COMPARATIVE POLITICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2110R	COMPARATIVE POLITICS	CP	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts of comparative politics	2	PO1, PO3, PO10, PSO2
CO2	Understand basic knowledge in the political theories	2	PO1, PO3, PO10, PSO2
CO3	Apply basic knowledge in the political parties and rights	3	PO1, PO3, PO10, PSO2
CO4	Analyse to acquire Knowledge in the concept of political Institutions	4	PO1, PO3, PO10, PSO2
CO5	Analyse the comparison between national politics	4	PO1, PO3, PO10, PSO2

Syllabus

Understanding Comparative Politics a) Nature and scope b) Why Compare and Methods of Comparison c) Going beyond Eurocentrism,Concept of Democratic Decentralisation , Evolution of Democratic Decentralisation , Significance of Democratic Decentralisation , Democratic Decentralisation in India

Approaches to Studying Comparative Politics a) Institutional Approach, System Approach, Structural Functional Approach b) Political Culture c) New Institutionalism,Political economy; Political sociology perspectives; Limitations of the comparative method

Historical context of modern government a) Capitalism: meaning and development: globalization b) Socialism: meaning, growth and development c) Colonialism and decolonization: meaning, context, forms of colonialism; anticolonialism struggles and process of decolonization

Themes for comparative analysis- A comparative study of constitutional developments and political economy in the following countries: Britain, Brazil, Nigeria and China.

A comparative study of constitutional developments and political economy in the following countries: Britain, Brazil, Nigeria and China.

Reference Books

1 Indian polity, Laxmikanth, 6-2022, Tata Mc Grawhill.

2 NCERT, GoI, 7-2021, NCERT.

3 Indian constitution, Basu DD, 9-2019, Agarwal.

4 Nitiayog Reports, GoI, 5-2022, GoI.

24BA2213R - PUBLIC FINANCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2213R	PUBLIC FINANCE	PF	R	2	1	0	4	4

Prerequisite

S#	Course Title	Acronym	Rule
1	MONEY AND BANKING	MBK	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the scope of public finance, public goods and MSA and Overview of Fiscal Functions, Tools of Normative Analysis.	2	PO1, PO10
CO2	Understand the various principles, cause and effect of public expenditure and Empirical evidence on public expenditure theories.	2	PO5, PSO2
CO3	Apply the source, types, incidence, effects of taxation along with the recent tax policies in India.	3	PO1, PO10
CO4	Analyse the effects of debt and concepts of Government budget.	4	PO1, PO5, PSO2
CO5	Fiscal Responsibility and Budget Management Act: An Evaluation. Trends in and Financing pattern of deficits in India and its macro-economic implications.	4	PO5, PO10

Syllabus

Introduction to Public Finance- Public Finance- Nature and scope- Public and Private finance- Public Goods and Externalities- Principal of Maximum Social Advantage. Theory of Public Finance. Overview of Fiscal Functions, Tools of Normative Analysis, Pareto Efficiency, Equity and the Social Welfare, Market Failure, Public Good and Externalities, Elementary Theories of Product and Factor Taxation (Excess Burden and Incidence.

Public Expenditure- Principles of Public Expenditure-Classification-Causes and Effects- Canons of Public Expenditure-Role in Developing Countries. Public Expenditure Theory Pure theory of public expenditure- Empirical evidence on public expenditure theories. Public Sector Pricing- Pricing of Public Utilities. Public expenditure management and control, Concept, measurement and magnitude of subsidies. Social infrastructure and financing of human development. Growth, nature and composition of public expenditure in India. Sustainability issues of Centre and State expenditure in India, Issues related to subsidies in India, Social Security and State level pension reforms in India.

Public Revenue & Tax Policy Issues in India-Public Revenue- Objectives- sources of Taxation- Types, Incidence and Effects of Taxation- role in eveloping economy- Indian Tax System: An assessment, Practical Issues of Tax reforms in India, An introduction to Value Added Tax, Value Added Tax: Design, Issues and Options. An introduction to MODVAT, CENVAT and Goods and Services Tax (GST), Issues in the taxation of Services in India.

Public Debt- Public Debt- Sources- Effects- crowding out Effect- Government Budgeting- classification- Concepts of Budget Deficits - Indian Union Budget. Measurement and macro-economic impact of deficits- alternative paradigms. The concept of budget. Fiscal deficit and interest rates: Analytical and empirical issues. Public debt burden and intergenerational equity. Issues related to public debt sustainability.

Recent Tax Policy-Taxable Capacity: Absolute and Relative Taxable Capacity. Factor Determining Taxable Capacity - Limits to Taxable Capacity. Trends and developments in Indian Fiscal Policy. Recent experience with stabilization functions of India government. Fiscal Responsibility and Budget Management Act: An Evaluation. Trends in and Financing pattern of deficits in India and its macro-economic implications.

Reference Books

1 Public Finance, R.K.Lekhi & Joginder Singh, 2nd, 2016, Kalyani Publishers.

2 Public Finance, B.P.Tyagi & H.P.Singh, 2nd, 2015, Macmillan..

3 Public finance in theory and practice, Richard A. Musgrave et.al., 5th, 1989, New York: McGraw Hill, 1989..

4 Public Finance, H.D.Bhatia, 2nd, 2022, Macmillan..

24BA2214R - HEALTH & ENVIRONMENTAL ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2214R	HEALTH & ENVIRONMENTAL ECONOMICS	HEC	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the growth equation showing the conditions under which higher growth post independent in India.	2	PO1, PSO2
CO2	Understand the trend in the public financing of education in India over the period 1980 s to 2010..	2	PO2, PSO2
CO3	Analyse an overview of the early contributors to the concept of human capital.	3	PO2, PSO2
CO4	Apply the method of Impact Evaluation for evaluating the benefits from health projects.	4	PO2
CO5	Analyse Economic concepts and their potential application in health.	4	PO2, PO5, PSO2
CO6	.Analyses Human Development in India	5	

Syllabus

Introduction, Health Economics: Overview, Structure and Beneficiaries, Concepts and Terminologies in Health Economics, Health as an Economic Good, Economics of Health vs Economics of Healthcare, Arrow\'s Perspective on Healthcare.

Introduction Demand in Healthcare, Utility and Health, Demand for Health care, Measuring price sensitivity with elasticities, The Grossman Model, The Grossman Model and Health Disparities, Supply in Health care, Physicians as Health Providers of Health, Supply Induced Demand,Hospitals as Health Providers of Health.

Equity and Health, Equity in Healthcare, Equity and Redistribution: Theory, Equity in Health Financing,Equity in Distribution, Practicals to measure equity, Financing and Insurance in Health Care, Financing Health care,

Describe basic concepts of health economics and its application in health sector, Uncertainty and Risk Health Insurance, Patient Payments Reimbursements,Information Economics in Health: Moral Hazard.

Health economics for health professionals and presents basic economic concepts and their potential application in health.

Health and education indicators Demographics, Socio-Economic and Caste Census, Education for All , Skill Development, Employment Scenario in India Burden of Diseases, Health for All, Drinking Water & Sanitation Social welfare schemes Poverty alleviation programs Other Development Indicators

Reference Books

1 Health Economics. Palgrave Macmillan, Bhattacharya, J., Hyde, T., & Tu, P. , Edition 03 2021, Wiley..

2 Microeconomic Theory: Basic Principles and Extensions. , Nicholson W. & Snyder C. M., Edition 2, 1997, South-Western College Pub.

3 Health Economics, Frank A. Sloan and Chee-Ruey Hsieh, Edition 2, 2011, The MIT Press.

4 Economics of Healthcare A Brief Introduction, Milken Institute, California, Edition 2, 2013, Cambridge University Press.

24BA2215 - INTERNATIONAL RELATIONS: THEORIES AND CONCEPTS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2215	INTERNATIONAL RELATIONS: THEORIES AND CONCEPTS	IR	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the concept of International Relations	2	PO1, PO3, PO4, PSO1
CO2	Understand the role of International Organizations	2	PO1, PO3, PO4, PSO1
CO3	Understand the basic structure of Indian foreign policy	2	PO1, PO3, PO4, PSO1
CO4	Apply the factors determinants of Indian foreign policy. .	3	PO1, PO3, PO4, PSO1
CO5	Analyses the significant issues of Indian foreign policy.	4	PO1, PO3, PO4, PSO1

Syllabus

Meaning, scope and nature of International Relations, Evolution of International Relations Theories: Realist, Liberal, Marxist and Critical Theories of IR, Emergence of nation states and nationalism, Power Politics: Balance of Power, Geopolitics, Bipolarity, Unipolarity, Multipolarity and Polycentrism. Pre-World War I International System, Post-World War II Period, and Cold War

International Organizations and Global Governance Role of International Organizations in International Peace and Security, Development, cooperation and Democratization, United Nations: Role, Relevance, and Reforms, SAARC, BRICS, G20, Global Governance: Issues and Challenges

Determinants of Indian Foreign Policy, Mission and Objective of Indian Foreign Policy, Evolution of Indian Foreign policy, and Institutional Framework of Indian Foreign policy, Indian diplomacy, Non-Alignment, Panchsheel Agreement, Look East Policy, Act East, Impact of LPG, Liberalization, Globalization and Privatization.

Issues in Indian foreign policy. India and Pakistan, India and China, India and Bangladesh, India and Myanmar, India and Afghanistan, and India and Sri Lanka Relations.

India and USA, India and USSR, Recent trends in Indian foreign policy, and Major recent challenges in Indian foreign policies.

Reference Books

1 International Relations Today, Aneek Chatterjee, 2nd Edition, 2018, Pearson Education.

2 International Relations, Vinay Kumar Malhotra, 5th Edition, 2016, SURJEET PUBLICATIONS.

3 International Organization: Theories and Institutions, J. Samuel Barkin , 3rd Edition, 2023, Palgrave Macmillan.

4 The Oxford Handbook of International Organizations, Jacob Katz Cogan , 1st Edition, 2016, OUP Oxford.

24BA2216R - INTERNATIONAL ORGANISATIONS AND INVESTMENT MODEL (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2216R	INTERNATIONAL ORGANISATIONS AND INVESTMENT MODEL	IOIM	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand functions and theoretical underpinnings, and evolution of international organization	2	PO1, PO4, PO6, PO10, PSO2
CO2	Apply to identify the success as well as drawbacks of League of Nations and United Nations, and assess the working of different UN agencies	3	PO1, PO4, PO6, PO10, PSO2
CO3	Apply the significance, development, functions and legal status of international financial institutions	3	PO1, PO4, PO6, PO10, PSO2
CO4	Analyse the influences on IMF in the international exchange system.	4	PO1, PO4, PO6, PO10, PSO2
CO5	Analyse the role of the WTO in International trade system	4	PO1, PO4, PO6, PO10, PSO2
CO6	Analyse the trend and performance of the global trade.	4	PO1, PO4, PO6, PO10, PSO2

Syllabus

The Meaning, Nature, Classification, Evolution and Functions of International Organization; and Legal Status of International Organizations, Theoretical underpinnings of International Organizations; Realism, Liberalism, Neo-Realist, Neo-Functionalist, Legalism And Constructivism; and Nation-State Sovereignty vs the legitimacy of International Organisations.

Major International Organizations: League of Nations, origin, structure, working and reasons for its failure; The United Nations, Origin, Structure, Powers and Functions, Specialized agencies of the UN, IAEA, UNESCO, UNCTAD, WHO and ILO, UN Programmes, UNICEF, UNEP; UN Peacekeeping, United Nations in the Post Cold War Era, Relevance of UN; Reformation and Restructuring of the UN and Revision of UN Charter; and Expansion of Security Council.

Origins of Bretton wood Institutions and International Financial System, International Financial Institutions: IBRD, ITO, IMF, World Bank, GAAT, WTO, GATS, ADB, UNCOMTRDE origins, structures.

International Trade: Production possibilities curve, Absolute advantage and comparative advantage, Partial equilibrium analysis, the benefits of free trade, and the effect of tariffs on trade, Exchange Rate System: determines the value of a currency, Key indicators that drive currency values and an illustration, Special cases: commodity currencies; reserve and safe haven currencies, how do exchange rates affect the economy, and how can governments intervene to influence the value of the currency, trend and performance of Global Trade from Cold War Era (1945-1990), Post Cold War Era (1991-2007), Post Finanacial Crisis (2010-2019), and Post Pandemic Era (2021 to present).

Reference Books

1 The World Since 1945: A Brief History, Daniel R Brower, First Edition, 2005, Pearson Prentice Hall.

2 Revitalizing the United Nations: Reform Through Weighted Voting, Joseph Schwartzberg, First Edition, 2004, New York: Institute for Global Policy.

3 Ruling the World: Power Politics and the Rise of Supranational Institutions, Lloyd Gruber, Second Edition, 2000, Princeton University Press.

4 International Organizations: The Politics and Processes of Global Governance, Margaret P. Karns and Karen A. Mingst , Second Edition, 2010, Boulder: Lynne Rienner.

24BA3119R - ECONOMICS OF GROWTH AND DEVELOPMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3119R	ECONOMICS OF GROWTH AND DEVELOPMENT	EGD	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the concept of growth and development and their significance in connection with various economic indicators.	2	PO1, PO10
CO2	Understand the significance of Human resource development which is very essential concept in economics in economic.	2	PO5, PSO2
CO3	Apply the economic planning and policy mentioned by different economist. A comprehensive picture they will get after going through these economic theories.	3	PO1, PO10
CO4	Analyse the theories of economic development for the deeper understanding along with its criticism.	4	PO1, PSO2
CO5	Analyse how development intersects with environmental sustainability, and be equipped with the knowledge and skills to contribute positively to this field.	4	PO5, PO10, PSO2

Syllabus

Growth and Development concepts, meaning, differences. Theories of growth : Harrods model, Lewis model of development with surplus labour, Balanced and Unbalanced Growth, human capitals and Economic Growth, Research and Development and Economic Growth, Process of Economic Development of less developed countries: Myrdal and Kuznets on economic development, Welfare indicators and measures of growth, Human development indices. The basic needs approach.

Land System and its changes, Commercialization of agriculture, Drain theory and critique, Infrastructure in Economic development, Manufacture and Transport, Jute, Cotton, Railways, Money and Credit, Human infrastructure concept, implication- education, health, housing, social sector initiatives, sustainable development.

Contribution of Vakil, Gadgil and V.K.R.V. Rao, Industry Trends in composition and growth, Role of public and private sector, Small scale and cottage industries, New Economic Reform and Agriculture: Agriculture and WTO, Food processing, subsidies, Agricultural prices and public distribution system, Impact of public expenditure on agricultural growth.

New Economic Policy and Employment, Employment and poverty, Rural wages, Employment Generation, New Rural, Employment Guarantee Scheme, Government budgeting, Women Empowerment, gender related issues, policy measures, National Youth Policy, Real Estate Regulation and Development, New banking policy.

Development and Environmental Sustainability, Renewable and Non Renewable Resources, Environmental Degradation, Intergenerational equity development, Economic Development and International Trade and Investment, Role of Multinationals.

Reference Books

1 Economics of Development and Planning, M L Jhingan, 42nd, 2007, Virnda Publication Pvt.Ltd.

2 Indian Economy, V K Puri, S K Misra, 39th, 2018, Himalaya Publishing House.

3 Indian Economy for Civil Services Examinations, Ramesh Singh, 15th, 2023-24, Mc Graw Hill.

4 Pratiyogita Darpan, Rahul Jain, Magazine, 2023, Mahendra Jain.

24BA3120R - INDIAN ECONOMIC PROBLEMS AND POLICIES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3120R	INDIAN ECONOMIC PROBLEMS AND POLICIES	IEPP	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand different income and non-income indicators of poverty.	2	PO1, PSO2
CO2	Understand the income and non-income dimensions of poverty in India context .	2	PO2, PSO2
CO3	Apply the factors that condition the nutritional status of children and adults in India.	3	PO2, PSO2
CO4	Apply the persistence of nutrition problem in India in spite of the progress made in poverty reduction.	3	PO2
CO5	Analyses regional disparity in terms of macroeconomic aggregates including growth rate, per capita GDP, et	4	PO2, PO5, PSO2
CO6	Analyses Public Finance in India	4	

Syllabus

entitled Poverty, Malnutrition and Inclusive Growth: Policy Implications throws light on the concept of Poverty, different income and non-income indicators of poverty, concept of Malnutrition and the factors conditioning the nutritional status of children and adults in India. It also covers the concept of inclusive growth along with the policy

entitled Employment and Unemployment: Policy Challenges covers various dimensions of unemployment in India, the concepts used in measuring employment and unemployment by NSSO and PLFS. The unit examines growth and the quality of employment in the post-reform period, and suggests various measures towards the employment policy framework.

entitled Social Security Measures in India discusses the meaning of social security, the approaches towards social security, different acts and programmes launched by the government on Social Security. It also analyses social security code and its benefits along with the policy measures.

Entitled Regional Disparity in India: Policy Implications sheds light on the meaning of regional disparity, analyses regional disparity in terms of macroeconomic aggregates including growth rate, per capita GDP, etc. Special focus has been given to the regional disparity in agriculture and infrastructural development, and on review of regional disparity in human development.

The early emphasis on nearly industry was one of the reasons of unemploymentm India is the second most unequal income distribution country globally.,Income inequalities can be reduced by lowering the taxation on the rich and luxuries.

Developmental and Non-developmental Expenditure Plan and Non-Plan Expenditure Tax and Non-tax Revenue Receipts Revenue Budget, Revenue and Non-revenue Receipts , Revenue Expenditure Revenue Deficit, Effective Revenue Deficit, Capital Budget, Capital Receipts Capital Expenditure Capital Deficit Fiscal Deficit, Primary Deficit, Primary Surplus, Monetised Deficit, Deficit and Surplus Budget

Reference Books

1 Government to Governance, , Kuldeep Mathur (2008), Edition 2, 2016, National Book Trust, New Delhi..

2 Indian economy since independence, Kapil Uma, Edition 4, 1998, New Delhi : Academic Foundation.

3 Overview of Indian Economy, France & Principality of Monaco, Edition 1, 2016, RBI Press .

4 Indian Economy, Datt Gaurav & Mahajan Ashwani, Edition 4 2021, S chandu Publisher New Delhi.

24BA3121 - DIGITAL LABOR MARKETS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3121	DIGITAL LABOR MARKETS	DLM	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the key concepts and theories related to the digital labor market.	2	PO1, PO5, PO10
CO2	Understand the implications of gig economy and remote work on traditional labor markets.	2	PO5, PSO2
CO3	Apply the automation and AI in shaping future labor demand and supply and policies and regulations in the context of digital work environments.	3	PO1, PO10
CO4	Analyze the impact of digital technologies on employment and work structures and Develop critical thinking and analytical skills to assess digital labor market trends and issues.	4	PO5, PSO2
CO5	Presentation and Communication on the digital labour markets and plaotform workers issues.	4	PO1, PO10, PSO2

Syllabus

Overview of digital transformation in labor markets, Key concepts: digital economy, digital platforms, gig economy, Historical perspective on labor market changes due to technology. Labor market theories in the digital age, Economic theories related to labor supply and demand, Human capital theory and skill requirements in the digital economy, Characteristics of digital labor platforms (e.g., Uber, Upwork, Fiverr), Types of gig work: on-demand, freelance, crowd work, Economic impact of gig economy on traditional employment,

Rise of remote work: drivers and trends, Advantages and challenges of telecommuting. Impact on work-life balance and productivity, Automation and AI in the Labour Market, Automation technologies and their applications in various sectors, Impact of AI on job displacement and creation, Future scenarios of labor demand and skills requirement, Skills and Education in the Digital Age, Digital skills and competencies required in the modern workforce, Role of education and training in addressing skill gaps, Lifelong learning and continuous professional development

Wages and Employment Conditions, Wage structures in the digital labor market, Employment conditions and job quality in gig and remote work, Economic inequality and labor market polarization, Labor Market Policies and Regulations, Regulatory frameworks for digital labor platforms, Labor rights and protections in the gig economy, Policy responses to challenges posed by digitalization, Case Studies, In depth analysis of specific digital platforms and their labor practices, Comparative study of digital labor markets in different countries, Successful policy interventions and best practices.

Ethical and Social Implications, Ethical considerations in digital labor markets (e.g., data privacy, algorithmic bias), Social implications of digital work (e.g., worker isolation, job security), Corporate social responsibility and sustainability in the gig economy, Future Trends and Conclusion, Emerging trends in digital labor markets (e.g., blockchain, platform cooperatives), Long-term implications of digitalization for labor markets.

Research Project Presentations, Student presentations on selected topics related to the digital labor market, Peer review and feedback sessions,

Reference Books

1 Digital Labour Markets in Central and Eastern European Countries: COVID19 and the Future of Work, Kamilla Marchewka Bartkowiak, 1e, 2022, Routledge.

2 Digitalisation and the Indian Labour Market: Trends, Challenges, and Opportunities, Sabina Dewan, JJN, 1e, 2022, Internationale Zusammenarbeit (GIZ) GmbH.

3 Digital Labour Markets in the Platform Economy , Dr. phil Florian A. Schmidt, 1e, 2017, FRIEDRICH-EBERT-STIFTUNG.

4 Digitalization and Employment A Review, Lorraine Charles, Shuting Xia and Adam P. Coutts, 1e, 2022, ? International Labour Organization .

24BA3122R - INDIAN FOREIGN POLICY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3122R	INDIAN FOREIGN POLICY	IFP	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the complexities involved in foreign policymaking of India.	2	PO1, PO3, PO4, PSO1
CO2	Understand the institutional practices involved in foreign policymaking of India	2	PO1, PO3, PO4, PSO1
CO3	Understand to comprehend the implications of Indian engagement with the world.	2	PO1, PO3, PO4, PSO1
CO4	Apply the new issues emerging in Indian interactions with other states.	3	PO1, PO3, PO4, PSO1
CO5	Analyse the new issues emerging in Indian interactions with other states and regional organizations.	4	PO1, PO3, PO4, PSO1

Syllabus

Indian Foreign Policy: Fundamentals of Foreign Policy, NAM and Panchsheel, Nehruvian and Post Nehruvian Phases, Indian Nuclear Policy, India and her Neighbours, Afghanistan, Pakistan, China, Nepal, Bhutan, Bangladesh, Myanmar, and Sri Lanka.

India and changing power equations, India and USA, India and Russia, India and China; India and her Neighbours, Afghanistan, Pakistan, China, Nepal, Bhutan, Bangladesh, Myanmar, and Sri Lanka.

Foreign Policy and Development; India as a rising economic power in Asia, and Border issues with Neighbours.

Challenges to Indian Foreign Policy: Terrorism, Indian Ocean as a Zone of Peace, String of Pearls; Problems of Indian Diaspora, and NRIs and PIOs.

India and regional economic formations, BRICS, ASEAN, BIMSTEC, UN, and Indian Act East Policy.

Reference Books

1 Foreign Policy of India, Khanna, V. N , 2018 7thEdition , Vikas Publishing House, New Delhi.

2 Foreign Policy Of India & Asia Pacific , Reddy, K Raja , 2012, 1st Edition , New Century, New Delhi.

3 Indian Foreign Policy: The Modi Era, Harsh V Pant, 2009, 1st Edition , Har-Anand Publications Pvt Ltd.

4 Foreign Policy of India: Problems and Paradoxes , Balakrishnan, T K , 2010, 1stEdition , Mohini Publishers: Bangalore.

24BA3223R - CONTEMPORARY ISSUES IN INDIAN ECONOMY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3223R	CONTEMPORARY ISSUES IN INDIAN ECONOMY	CIIE	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the impact of LPG policies on economic growth in India.	2	PO1, PO5, PO10
CO2	Understanding of the intersections between agricultural policy, economic development, and sustainable practices, and be equipped with the knowledge and skills to contribute positively to these fields.	2	PO5, PSO3
CO3	Apply various factors influencing business environment, economic policies, fiscal management, and reforms, and be equipped with the knowledge and skills to contribute positively .	3	PO1, PO10
CO4	Analyze the financial system, regulatory environment, and economic policies in India, and be equipped with the knowledge and skills.	4	PO5, PSO3
CO5	Analyse the Indias trade policies, financial reforms, and their impact on the economy, and be equipped with the knowledge and skills to contribute positively to these fields.	4	PO1, PO10, PSO3

Syllabus

Genesis and Impact of LPG; Indias population policy (2012); Demographic Dividend; Indias human development in global perspective (calculation and performance), Urbanization (Definition, importance, problems) and Smart City Mission; Informal sector (Definition, Problems, Solution); Impact of COVID19 Pandemic; Atma Nirbhara Bharat Abhiyan.

Agriculture and WTO; Price policy and Subsidies; Commercialisation and Diversification (Importance, Problems); Public Distribution System; Impact of public expenditure on agricultural growth; Agrarian Crisis, Doubling Farm Incomes, MGNREGS, New Industrial Policy and changes (2020 -2025) ; Public sector reform; Privatisation and Disinvestment; Competition Policy(Objectives, impact).

Ease of Doing Business (factors); Performance of MSMEs; Role of MNCs in Industrial Development; Make in India, development of economic and social infrastructure; National Monetization Pipeline, Tax, Expenditure, Budgetary deficits; Pension and Fiscal Reforms; Public debt management and reforms; Fiscal Responsibility and Budget Management (FRBM) Act ; GST, Fiscal Federalism and Fiscal Consolidation.

Recommendations of the Current Finance Commission, Organisation of Indias money market; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI, Working of SEBI in India; Changing roles of the Reserve Bank of India ; Commercial banks, Development Finance Institutions, Foreign banks and Non banking financial institutions; Analysis of price behaviour in India.

Anti inflationary measures; Demonetization and its impact, Indias foreign trade; India Balance of payment since 1991; New Exchange Rate Regime: Partial and full convertibility; Capital account convertibility ; FDI Trends and Patterns ; New EXIM policy, WTO and India ; Bilateral and Multilateral Trade Agreements and Associations.

Reference Books

1 Indian Economy- Problems of Development and Planning, Agrawal A.N., 1e, 2015, Kalyani publishers.

2 The Indian Economy, Dhingra I.C, 1st, 2022, Sultan Chand & Sons.

3 Indian Economy: Policies and Performances, Kapila Uma, 4th, 2013, Academic Foundation.

4 The Political Economy of Development in India, Bardhan, P.K., 9th, 2012, Oxford University Press, New Delhi..

5 Indian Economy and Its development experience, Mishra S.K and V.K Puri, 5th, 2008, Himalaya Publishing House.

24BA3224 - COMPUTER APPLICATIONS IN ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3224	COMPUTER APPLICATIONS IN ECONOMICS	CAE	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the Computer Application in Economic scope and limitations .	2	PO1, PSO3
CO2	Understand basic components of computer CPU, input and output devices: keyboard, mouse, scanner, VDU, printers, primers plotters.	2	PO2
CO3	Apply the computers and their applications, hardware, software and firmware.	3	PO4
CO4	Apply the Generations of programming languages and their applications.	3	PO4
CO5	Apply the Generations of programming languages and their applications.	4	PO2, PSO3

Syllabus

Introduction to Operating System and Networking, Introduction to operating system, types and versions of operating system.Components of the windows operating system: desktop, menus, taskbar, control panel, accessories., Introduction to networking communication, goals of network, types of network, network topologies.,Introduction to internet, applications of internet, use of internet in research.

Data Management tools MS-excel basics, functions, charts, sorting data, filtering data, macros, pivot table. Introduction to DBMS, definitions, role, purpose and advantages of databases, basic concepts of data, information, file, record, tables and relationships.,

Overview of E-Commerce, Introduction to e-commerce, e-commerce business models, security in e-commerce.,E-payment systems: credit cards, e-cash, e-wallet, introduction to secure electronic transaction (SET)., E-security: introduction, concepts, challenges and threats for e-security, solutions: cryptography, digital signatures, authentication, digital certificates, and secure socket layer..

Economics and Banking, Introduction, definition, concept, need of e-banking.,Forms of e-banking: electronic banking, PC banking, Internet banking, remote banking, mobile banking.,Introduction, concepts, components of wireless banking, risk management, Introduction to cyber crime and cyber law,

MS Word :Word Basics Starting Word, Creating Documents, Parts of a world window, Formatting Features, Menus, Commands, Toolbars& their icons Mail Merge Macros word Exercises.

Reference Books

1 Computer Applications in Economics , K.Dhanasekaran, Edition1, 2014, VRINDIA.

2 Computer Applications In Economics, K. Dhanasekaran , Edition 1, 1984, Vrinda Publications.

3 Computer Applications in Business, R Parameswaran, Edition 1, 2012, S Chand .

4 Computer Applications In Management, Sanjay Saxena, Edition 2, 1990, Excel Books,.

24BA3225 - LOCAL GOVERNANCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3225	LOCAL GOVERNANCE	LG	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Gain basic knowledge in the Local Governance	2	PO1, PO3, PO10, PSO1, PSO2
CO2	Understand the basic concepts of Acts in Governance	2	PO1, PO3, PO10, PSO1, PSO2
CO3	Gain basic knowledge in the rural governance	2	PO1, PO3, PO10, PSO1, PSO2
CO4	Acquire Knowledge in the concept of urban development	3	PO1, PO3, PO10, PSO1, PSO2
CO5	Analyse and Acquire Knowledge in the concept of urban development	4	PO1, PO3, PO10, PSO1, PSO2

Syllabus

Introduction, Historical Overview ,Post- independence Developments , Brief Overview of Initiatives Post -independence

Initiatives after Economic Reforms , Functioning of PRIs in Various States after 73rd Amendment , Functioning of Local Governance after 73rd and 74th Constitutional Amendment: Observations

The Gram Panchayat, Three Levels of Panchayats, Rural Administration, Rural Livelihoods, Urban Livelihoods, Equality in Indian democracy, Issues of equality in other democracies, Challenge of democracy,, Role of the Government in

Institutional Capacity Building ,Capacity Building of Elected Functionaries ,Capacity Building of Local Administration , Knowledge Networking , Community Empowerment

Capacity Building of Elected Functionaries ,Capacity Building of Local Administration , Knowledge Networking , Community Empowerment

Reference Books

1 Indian Polity, Laxmi kanth, 6-2021, Tata Mc Grawhill.

2 Indian Administration, Goyal, 6-2021, Anmol Publications.

3 Local Government, S R Maheswari, 7-2018, Tata Mc Grawhill.

4 Indian Constitution, Basu DD, 5-2019, Agarwal.

24BA3226 - POLITICAL DYNAMICS AND WORKING OF INDIAN CONSTITUTION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3226	POLITICAL DYNAMICS AND WORKING OF INDIAN CONSTITUTION	PDWIC	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the historical developments that culminated in the drafting of the Indian Constitution	2	PO1, PO3, PO4, PSO1
CO2	Understand the basic features of the Indian Constitution	2	PO1, PO3, PO4, PSO1
CO3	Understand the structure of the Federal Government as defined by the Indian Constitution	2	PO1, PO3, PO4, PSO1
CO4	Apply the Indian Judicial System influences in the transparency of judicial activities.	3	PO1, PO3, PO4, PSO1
CO5	Analyse the influences of election commission roles in Indian democracy.	4	PO1, PO3, PO4, PSO1

Syllabus

Making of the Constitution: A brief analysis of National Movement. Constitutional Development with reference to Government of India Act 1909, 1919, 1935 and Indian Independence Act 1947, and the Constituent Assembly of India.

Basic features of the Indian Constitution: The Preamble, Fundamental Rights, Directive Principles of State Policy Fundamental Duties, and Government of the Union: The Union Executive the President and the Vice-president

The Council of Ministers and the Prime Minister Powers and functions, The Union legislature The Parliament . The Lok Sabha and the Rajya Sabha, Composition, powers and functions the role of the Speaker. Government of the State: The Governor, and the Council of Ministers and the Chief Minister Powers and Functions,

The State Legislature composition, powers and functions. The Indian Judicial System: The Supreme Court and the High Court.

Election Commission: Role and Functioning, Chief Election Commissioner, and Election Commissioners and UPSC.

Reference Books

1 Indian Polity, Laxmikanth, 2023, 7th Edition , MCGraw Hill Education Foundation .

2 Our Constitution, Subhash C. Kashyap, First Edition, 2021, National Book Trust.

3 Constitutional Law of India , HM Seervai, Fourth Edition, 2017, Universal Law Publishing House .

4 Constitution of India, V N Shukla, 2024, 1st Edition , Law books.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Skill Development Courses (SDC)

23SDBA04 - SOCIAL GEOGRAPHY AND CARTOGRAPHY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDBA04	SOCIAL GEOGRAPHY AND CARTOGRAPHY	SGC	R	0	0	2	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand of the basic concepts and theoretical frameworks of social geography, and interpret the complex relationships between society, space, and place.	2	
CO2	Understand of the complex interplay between social processes and spatial dynamics in the formation and transformation of social regions.	2	
CO3	Apply the social structure, diversity, and well-being in India, as well as the challenges and opportunities for building a more equitable and inclusive society.	3	

Syllabus

Basic Concepts: Meaning, scope and approaches of Social Geography; Concept of tribe, ethnicity, society, gender, social space; Social differentiation and stratification; Social morphology.

Social Regionalization: Social differentiation and region formation; Bases of social region formation; Racism and racial discrimination; Ethnicity, identity and urban segregation; Social stratification and exclusion.

Social Structure in India: Peopling of India; Evolution of social regions; Tribes and their distribution; Caste: concept & hierarchy; Unity in diversity; Gender and human development. Social Well-being in India:

Concept of social well being. Social issues: crime, health care, education, and housing; Gender issues; Social policies and planning; Social impact assessment. Maps: Components and classification Survey of India topographical maps, Thematic maps: Proportional squares, pie diagrams with proportional circles, dots and spheres

Reference Books

1 Social Geography, Ahmed A, 2002, 1st Edition, Rawat Publications.

2 Social Geography: An Introduction to Contemporary Issues, Cater, J. and Jones T, 1989, 1st Edition, Hodder Arnold.

3 . Introducing Social Geographies,, Rachel, P., Burke, M., Fuller, D., Gough, J., Macfarlane, R. and Mowl, G, 2001, 1st Edition, Oxford University Press.

4 Social Geographies: Space and Society, Valentine, G, 2001, 1st Edition, Routledge.

24SDBA01 - INTRODUCTION TO GEOGRAPHY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDBA01	INTRODUCTION TO GEOGRAPHY	IG	R	0	0	2	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the basic concepts of geography	2	PO1, PO10, PSO1
CO2	Developing competence in using geographical knowledge, concepts, and skills	2	PO1, PO10, PSO1
CO3	Understanding the relationship between the physical and human world in geographical perspective	2	PO1, PO10, PSO1
CO4	comprehensive understanding of various geographical concepts, processes, and phenomena.	2	PO1, PO10, PSO1

Syllabus

The Earth in the Solar System, Globe: Latitudes and Longitudes, Motions of the Earth, Maps, Major Domains of the Earth, Our Country India, Environment, Inside Our Earth, Our Changing Earth, Air, Water, Human Environment Interactions the Tropical and the Subtropical Region

Life in the Deserts, Resources, Land, Soil, Water, Natural Vegetation and Wildlife Resources, Agriculture, Industries, Human Resources

India Size and Location, Physical Features of India, Drainage, Climate, Natural Vegetation and Wildlife, Population, Resources and Development

Resources and Development, Forest and Wildlife Resources, Water Resources, Water Resources, Agriculture, Minerals and Energy Resources, Manufacturing Industries, Lifelines of National Economy

Reference Books

1 Resources and Development, Forest and Wildlife Resources, Water Resources, Water Resources, Agriculture, Minerals and Energy Resources, Manufacturing Industries, Lifelines of National Economy, NCERT, 2024, GOI.

2 Our Environment (TEXTBOOK IN GEOGRAPHY FOR CLASS VII) , NCERT, 2024, GOI.

3 RESOURCES AND DEVELOPMENT (TEXTBOOK IN GEOGRAPHY FOR CLASS VIII, NCERT , 2024, GOI.

4 4. CONTEMPORARY INDIA-I (TEXTBOOK IN GEOGRAPHY FOR CLASS IX) , NCERT, 2024, GOI.

5 5. CONTEMPORARY INDIA-II (TEXTBOOK IN GEOGRAPHY FOR CLASS X), NCERT, 2024, GOI.

6 FUNDAMENTALS OF PHYSICAL GEOGRAPHY TEXTBOOK FOR CLASS XI, NCERT, 2024, GOI.

7 7. FUNDAMENTALS OF HUMAN GEOGRAPHY Textbook for Class XII, NCERT, 2024, GOI.

24SDBA02 - PHYSICAL GEOGRAPHY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDBA02	PHYSICAL GEOGRAPHY	PG	R	0	0	2	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the Origin and evolution of the Earth, Earths crust, earthquakes, volcanism, landforms, and processes of weathering and erosion.	2	PO1, PO10, PSO1
CO2	Analyse the Structure and composition of the atmosphere, temperature and pressure belts of the world, heat budget of the Earth, atmospheric circulation, humidity, precipitation, cyclones, and climatic regions	3	PO1, PO10, PSO1
CO3	Understanding the Bottom topography of the Atlantic, Indian, and Pacific Oceans, temperature, salinity, and density of sea water, ocean currents, El Nino, La Nina, and marine resources.	2	PO1, PO10, PSO1
CO4	Analyse the various factors for Soil formation, factors influencing world distribution of plants and animals, and ecosystem and biodiversity.	3	PO1, PO10, PSO1

Syllabus

Factors controlling landform development, endogenetic and exogenetic forces, earthquakes, volcanism, geomorphic processes weathering, mass wasting, erosion, and deposition. Landforms Fluvial, Karst, Aeolian, Glacial, and Coastal.

Composition and structure of the atmosphere, insolation, heat budget of the Earth, temperature, pressure belts and wind systems, air masses and fronts, atmospheric disturbances, cyclones and anticyclones. Climate classification Koppen\'s, Thornthwaites, and Trewarthas.

Ocean floor topography, ocean deposits, temperature, salinity, density, ocean water circulation, waves, tides, ocean currents, and marine resources.

Factors influencing the distribution of plants and animals, biodiversity, biomes, conservation of biodiversity, and environment and ecology.

Reference Books

1 NCERT Geography Textbooks: (Class 11 and 12), NCERT, 2024, Govt of India.

2 Certificate Physical and Human Geography by G.C. Leong., G.C. Leong, 02, Oxford University Press.

3 Fundamentals of Physical Geography, Savindra Singh, 2020, Pravalikha .

4 Geography of India, Majid Hussain, 07, McGraw Hill Education.

5 Geomorphology, Savindra Singh, 2020, Pravalikha.

24SDBA03 - GEOGRAPHY OF INDIA (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDBA03	GEOGRAPHY OF INDIA	GI	R	0	0	2	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Physical Geography of India	2	PO1, PO10, PSO1
CO2	Economic Geography of India	2	PO1, PO10, PSO1
CO3	Social Geography OF India	2	PO1, PO10, PSO1
CO4	Geopolitics and Regional Development	3	PO1, PO10, PSO1

Syllabus

Physical Divisions Himalayas, Peninsular Plateau, Indo Gangetic Plains Climate Regional Variations, Climatic Regions of India Soils Types, Distribution, Soil Erosion and Conservation Natural Vegetation and Wildlife Forest Types, Conservation Efforts

Agriculture Types, Major Crops, Agricultural Systems in India Industry Types, Location Factors, Major Industrial Regions in India Resources Types, Distribution of Natural Resources (Minerals, Water, Forests) Transportation and Communication Networks, Trade Routes

Population Demographic trends, migration patterns, urbanization. Settlement Rural and urban settlements, types, and patterns. Transport and Communication Infrastructure development, connectivity.

Geopolitical Issues Borders, Boundary Disputes, Strategic Locations Regional Planning Concepts, Regional Development Programs in India Environmental Geography Environmental Hazards, Climate Change, Sustainable Development Contemporary Issues Urbanization, Population Pressure, Resource Depletion

Reference Books

1 Certificate Physical and Human Geography, Goh Cheng Leong, 2023, Oxford University Press.

2 India: A Comprehensive Geography, D.R. Khullar, 2020, Kalyani Publishers.

3 Geography of India, Majid Husain, 7th, McGraw Hill Education.

4 Indian and World Geography, Majid Husain , 06, McGraw Hill Education.

5 Regional Planning and Development, Mahesh Chand and V.K. Puri, 1983, Allied Publishers.

24SDBA05 - ECONOMIC GEOGRAPHY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDBA05	ECONOMIC GEOGRAPHY	EG	R	0	0	2	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the concepts, theories, and approaches in economic geography, enabling them to analyze and interpret the spatial dimensions of economic activities	2	PO1, PO3, PO10, PSO2
CO2	Understand the concepts, theories, and spatial dynamics of economic activities, with a focus on primary sector activities such as agriculture, forestry, fishing, and mining	2	PO1, PO3, PSO2
CO3	Apply the spatial dynamics and economic significance of secondary (manufacturing) and tertiary (transport, trade, services) economic activities.	3	PO1, PO3, PSO2

Syllabus

Meaning and approaches to economic geography, Concepts in economic geography: Goods and services, production, exchange and consumption, Concept of economic man, theories of choices.

Concept and classification of economic activities, Factors affecting location of economic activity with special reference to agriculture (von Thunen), and industry, Primary activities: Agriculture, forestry, fishing and mining

Secondary activities: Classification of manufacturing, concept of manufacturing regions, special economic zones and technology parks, Tertiary activities: Transport, trade and services

Transnational sea-routes, railways and highways with reference to India, International trade and economic blocs, WTO and BRICS: Evolution, structure and functions

Reference Books

1 Key Concepts in Economic Geography, Aoyama, Y., Murphy, J.T., Hanson, S, 2010. 1st Edition, Sage..

2 Economic Geography: A Contemporary Introduction,, Coe N. M., Kelly P. F. and Yeung H. W, 2019, 3rd Edition, Wiley-Blackwell..

3 India: A Comprehensive Geography, Khullar, D.R, 2018, 3rd Edition, Kalyani Publishers.

4 Economic Geography of India, Sharma, T.C, 2013, 1st Edition, Rawat Publications..

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Professional Elective Courses (PEC)

24BA11H1 - MODERN INDIAN LANGUAGE- HINDI-1 (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA11H1	MODERN INDIAN LANGUAGE- HINDI-1	MILH1	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Introduction to Hindi Language , General Grammar , Noun Pronoun, Case, Gender and Number , From the textbook chapter , Sahitya ki Mahatta , Revision of Grammar and Formation of Sentences	2	PO1, PO2, PO4, PSO1
CO2	Understand From textbook , Usne kaha tha, Poose ki Raat ,Grammar , Tenses and Sentence formation , Correction of Sentences , Correction of words and sentences	2	PO1, PO2, PO4, PSO1
CO3	Understand Sanskriti aur Sahitya ka Sambandh , Comprehension and Reading , Bharath ek Hai , Comprehension and Reading , Practice of rewriting sentences of grammar , Official terminology of 50 words, numerals	2	PO1, PO2, PO4, PSO1
CO4	Understand Letter writing , formal/informal , Names of eatables, colours, flowers, and general conversation , Names of the months, years and days in the week , Short sentences on daily use, Hindi communication language and translation	2	PO1, PO2, PO4, PSO1

Syllabus

Introduction to Hindi Language General Grammar ,Noun Pronoun, Case, Gender and Number From the textbook chapter , Sahitya ki Mahatta Revision of Grammar and Formation of Sentences

From textbook , Mitrata, Poose ki Raat Grammar , Tenses and Sentence formation Correction of Sentences Correction of words and sentences

Sanskriti aur Sahitya ka Sambandh , Comprehension and Reading Bharath ek Hai , Comprehension and Reading Practice of rewriting sentences of grammar Official terminology of 50 words, numerals

Letter writing , formal/informal Names of eatables, colours, flowers, and general conversation Names of the months, years and days in the week Short sentences on daily use, Hindi communication language and translation

Reference Books

1 Gadhya Sandhesh, Ram Chandra Tiwari, 1ST edition Hindi, Lorven Publications.

2 Saral Hindi Vyakaran, OMPRAKASH SHASTRI, 2nd Edition, DBHP Sabha.

3 Poos ki raat, Premchand, 2nd Editon, Lorven publications.

4 Grammar , Omprakash, 2nd Edition, Lorven publications .

24BA11T1 - MODERN INDIAN LANGUAGE -TELUGU-1 (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA11T1	MODERN INDIAN LANGUAGE -TELUGU-1	MILT1	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the antiquity and uniqueness of Telugu literature are recognized. They develop knowledge of the social conditions of the Nannayya period, the language and culture, and the political issues of the epic period.	2	PO3, PO6, PSO1
CO2	Understand and Learn How To Maintain a Property and Right Life, The Importance of of purity in Human Life, The Role of Parents in the Behavior of Children, and Learn About Variable Social Problems, theCauses, and Acceptable Solutions.	2	PO3, PO6, PSO1
CO3	Understand and learn about the social, cultural and religious conditions of the 13th century,-- Ekeshwaropasana-Saiva Vaishnava Abhedam-Hariharadvaita-15 parvas tikkana in India and the importance of "peace" in human life.Understand the relations between employer and employee.	2	PO3, PO6, PO10, PSO1
CO4	Understand the articulation skills through the Ramayana Mahakavya-the behaviour of human beings-the moral values to be followed by man, family relations, etc.,,-and the mistakes that naturally arise in telugu scripture-right...., some of the spelling errors asked in the UPSC examinations...., some of the spelling errors asked in the UPSC examinations. Practice.. and essay-essay writing - general essays.	2	PO3, PO6, PSO1

Syllabus

Adikavi Nannayya Virachita Andhra Mahabharata ,Sabhaparvam ,Prathamaswasam , 26th verse to 57th verse , "Raajneeti" , Text Part , Mahabharata Mahetihasam Prashastyam ,Vedavyasudu ,Telugu Mahabharata ,Kavitryam ,Nannayya\'s Poetic Characteristics ,and Vyasa , Vyasa , Essay Writing , General Essays , Definition of IDIOMS , Contexts commonly asked in civil services .,

The importance of the poetic age in ancient literature, the writings of Srinatha, who is given the title of Kavisarvabhouma, Ishvaraarchana Kalaseela, the glory of Srinatha, The glory of Srinatha-Srinatha,s secrets features,The glory of Kashikhanda,The youth of man, the danger bells,gunanidhi katha, through the story of gunanidhi, srinatha\'s message to the youth and the mothers who are guilty of the faults of the children, etc. and antonyms,the identification of the correct antonyms, the antonyms given in the, some of the antonyms asked in the UPSC tests are practice.. and essay..essay writing ,general essays..

Kavibrahma Virachita Andhra Mahabharata,Virataparvam,Prathamaswasam,116th verse to 146th verse,"Dhaumya dharopadesam", the text part , the characteristics of the servant , the procedures to be behaved in front of the employer , Interpretition to the present day society,hariharaadwaita siddhantam,tikkana natakiya Kavita lakshnam,samaanaardhaka padamulu,paryaaya padamula gurtimpu,naanaardha padamulaku,samaanaardhaka padamulaku tedaa gurtimche vidhaanam,UPSC parikshalalo adigina konni samaanaardhakapadamulu,abhyaasam,vyaasa Rachana,sadhaarana vyaasamulu.

Srimad ramayanam by Valmiki,Telugu Ramayanas,Atkuri molla virachita Molla Ramaayanam,from verse 4oth to 87 poem in Sundarakanda,the behaviour of human beings,the moral values to be followed by humans,family relations,etc., some of the spelling errors asked in UPSC examinations essay writing,current topics.

Reference Books

1 Srimadandhra Mahabharata, Nannayya Bhattu, First Edition1985 , Tirumala Tirupati Devasthanams,Tirupati.

2 Kashikhandamu- Srinathudu, Srinathudu, First Edition,1995, Potti Sriramulu Telugu University,Hyderabad.

3 Srimadandhra Mahabharata, Kavibrahma Tikkanaamaatya , First Edition ,1985, Tirumala Tirupati Devasthanams,Tirupati.

4 Molla Ramayanam , Atkuri Molla , First Edition,1980, Andhra Pradesh Sahitya Akademi ,Hyderabad..

24BA12H2 - MODERN INDIAN LANGUAGE- HINDI-2 (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA12H2	MODERN INDIAN LANGUAGE- HINDI-2	MILH2	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the history of COI 1: Grammar with sentences and corrections COI 2: General Grammar ,Gender and Number, Numerals COI 3: From textbook , : Kabirdas COI 4: Revision of Grammar and Formation of Sentences	2	PO1, PO2, PO3, PSO1
CO2	Understand the history of CO2: Communication in Hindi language COI 1: Bihari Lal/Geeth Farosh (Bhavani Prasad Mishra) COI 2: From textbook , Todati Patthar(Suryakant Tripathi Nirala) COI 3: From textbook , Raheem COI 4: Sentence framing and correction	2	PO1, PO2, PO3, PSO1
CO3	understand the importance of CO3: Translation from Hindi to English and English to Hindi COI 1 : Formation and correction of sentences COI 2 : Interpretation and correction of words COI 3 : Translation to Hindi from English and vice versa COI 4 : Antonyms	2	PO1, PO2, PO3, PSO1
CO4	understand the importance of CO4: Letter Writing COI 1 : Official letter COI 2 : Personal letter COI 3 : Administration terminology of 200 words COI 4 : Hindi communication language	2	PO1, PO2, PO3, PSO1

Syllabus

Grammar with sentences and corrections General Grammar ,Gender and Number, Numerals From textbook : Kabirdas Revision of Grammar and Formation of Sentences

Communication in Hindi language Bihari Lal/Geeth Farosh (Bhavani Prasad Mishra) From textbook , Todati Patthar(Suryakant Tripathi Nirala) From textbook , Raheem Sentence framing and correction

Translation from Hindi to English and English to Hindi Formation and correction of sentences Interpretation and correction of words Translation to Hindi from English and vice versa

Letter Writing Official letter Personal letter Administration terminology of 200 words Hindi communication language

Reference Books

1 Geeth Farosh , Bhavani Prasad Mishra, 1st Edition, Vani Prakashan.

2 Non-Detail , Kathalok, 1st Editon, Sudha Publications .

3 Saral Hindi Vyakaran, Manoj Kumar Mishra, 2nd Edition, DBHP Sabha, Hyderabad.

4 Grammar , Mishra, 2nd Edition, Lorven publications .

24BA12T2 - MODERN INDIAN LANGUAGE -TELUGU-2 (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA12T2	MODERN INDIAN LANGUAGE -TELUGU-2	MILT2	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the history of Modern Telugu Literature and the main themes of poetry in connection with the society basing on the prescribed texts. Different Literey movements,different isms etc.	2	PO1, PO2, PO6, PSO3
CO2	Understand the importance of Modern Telugu form PROSE "Kathaanka"(Short story) regarding the change the mind set of common people and indian farmers basing on the prescribed stories.	2	PO1, PO2, PO6, PSO3
CO3	Understand the importance of Modern Telugu form "NOVEL" ., and its role to bring equality among humans irrespective of religion,caste,creed and gender basing on the prescribed NOVEL	2	PO1, PO2, PO6, PSO3
CO4	Understand the hostory of Telugu Drama and its role in narration of lives of the artists who performed their art in "YAKSHAGAANA" and the importance of Literary Criticism	2	PO1, PO2, PO6, PSO3

Syllabus

Adhunika Telugu Kavitvam,nirvachanam,aavirbhaavam,aadhunika kavitaa lakshanalu,aadhunika kavitaa vikaasam,astitva vaada kavitaa dhoranulu,kavikokila sri duvvuri raamireddy,kondavidu charitraka nepathyam,anisette subbaaraavu rachimchina maatrusangitam, desabhakti mariyu abhyudaya kavitvam,Sri bandaru prasada ravu vrasina tatako nulupogu paathyam,saamaajika dalita kavitvam oka parichyam,saamaajika vyaasaalu,vartamaana samaaja anvayam UPSC prasnaa patraalalo ivvabadina vyaasaalanu parisilimchatam,comprehensionlu pariseelinchatam,abhyaasamu,saadhaarana vyaasamu.,

Intriduction to Telugu Literary Trend Kathanika,Telugu Kathanika Vikasam, BHAYAM Kathanika written by Sri Kalipatnam Ramarao and its messege to society how to come out from fear psychosis,Swedam Kharidu lesson written by Sri Rentala Nageswara Rao,the effect of globalisation on Indian agriculture and marketing the agricultural products,the sufferings of Indian farmers,Social Essays, Previous UPSC Question Papers,Model essays and practice.

Telugu Novel,Definitions,Telugu navala,aavirbhaava vikaasaalu,navalaa lakshanaalu,Radha Chakralu novel by Sri Mahidhara Ramamohana Rao, Essence of Novel, Messege to Indian Society,Sri Yallapragada Mallikarjuna Rao,Navala Samiksha, Precis Writing,UPSC Previous Papers,Precis Writings,Practice,Essay Writing,Social and Political Essays.,

Telugu Drama,Parinama vikasalu,Yakshaganam natakam written by Sri M.V.S.Haranatha Rao,Srikandimalla Sambasivarao vrasina apurupa kalarupala vidhwamsa drusyam yakshagaanam,vimarsa nirvachanalu,uttama vimarsakuni lakshanalu,vimarsa bhedalu,vimarsa prayojanalu,samkshipteekarana,ivvabadina khandikanu mudava vantunaku kudimchi vraayatam,UPSC Previous Paperslo ivvabadina khandikalanu abhyaasam cheyatam.

Reference Books

1. Adhunika Kavitva Parichayam, Prof.S.V. Satyanarayana , First Edition-2005, Visalandhra Publishing House,Hyderabad.
2. Kathanika Swarupa Swabhaavaalu, Dr.Poranki DakshinamUrti, Second Edition -2011, Navodaya Book House,Vijayawada .
3. Telugu Natakam Parichayam, Prof.S. Gangappa , First Edition -2002, Visalandhra Publishing House,Hyderabad.
4. Telugu Navala,Samkshipta Charitra , Sri Ampasayya Naveen, First Edition-2018, Telugu Academi,Hyderabad.
5. Sahitya Sopanaalu, Prof.Divakarla Venatavadhani, First Edition--1985 , Andhra Pradesh Sahitya Academi,Hyderabad.

24BA2111R - INTERNATIONAL ECONOMICS AND FINANCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2111R	INTERNATIONAL ECONOMICS AND FINANCE	IEF	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts and theories of international trade like Heckscher-Ohlin theory of trade; Leontief Paradox; Rybczynski theorom.	2	PO1, PO10
CO2	Understand economic models based on specialization and export-orientation in the real world. Assess the role of international trade, gains from trade, trade patterns	2	PO5, PSO1
CO3	Application of international financial systems and foreign exchange markets and expenditure-switching policies and direct controls adjustment: Policies for achieving internal and external equilibrium	3	PO1, PO10
CO4	Analyze theRise and fall of Gold standard and Bretton-woods system; International trade and financial institutions-Functions of GATT/WTO, IMF, World Bank.	4	PO5, PSO1
CO5	Analyse the emergence of International Monetary System, Institutions and Regional Blocks. Emergence of trade block at global level	4	PO1, PO10

Syllabus

Theory of international Trade: The pure theory of international trade- Law of Reciprocal Demand; Heckscher-Ohlin theory of trade; Leontief Paradox; Theorem of factor price equalization; The Rybczynski theorem; Concept and policy implications of immiserizing growth.

Effects of Trade and Theory of Interventions. Concepts of terms of trade; Hypothesis of secular deterioration of terms of trade and policy implications for less developed countries; Measurement of gains from trade and their distribution; Tariffs - Economic effects of tariffs (partial and general), Custom duties- partial and general analysis.

Balance of Payments: Meaning and components of balance of payments; Equilibrium and disequilibrium in the balance of payments; The process of adjustment under systems of gold standard, fixed and flexible exchange rates; Expenditure-changing and expenditure-switching policies and direct controls adjustment: Policies for achieving internal and external equilibrium simultaneously under alternative exchange rate regimes;

Emergence of International Monetary System, Institutions and Regional Blocks. Rise and fall of Gold standard and Bretton-woods system; International trade and financial institutions-Functions of GATT/WTO, IMF, World Bank and Asian development Bank; Emergence of trading blocks at the global level; SAARC/SAFT A and ASEAN regions.

Patterns (Structure) of Lndia\'s Foreign Trade Volume, Trends, Composition, Direction, etc., Export Performance and Export Competitiveness. India\'s Trade Policy: Review of Pre and Post, Liberalization, Exim Policies, Export Promotion Policies, SEZs; Tariff Structure, RTAs and FTAs, India and WTO: Uruguay Round, Highlights of Ministerial Meetings:Foreign trade multiplier with and without foreign repercussions and determination of national income and output.

Reference Books

1 International Economics., Cherunilam, Francis , 3rd, 2017, Tata McGraw-Hill, New Delhi..

2 International Economics, Dominick Salvatore, 13e, 2021, Paperback.

3 International Economics: Trade and Finance, Dominick Salvatore, 11th, 2014, Wiley, .

4 International Economics, M.L. Jhingan, 6th, 2009, Vrinda Publications P Ltd..

24BA2112R - INDUSTRIAL ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA2112R	INDUSTRIAL ECONOMICS	IE	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the nature and importance of different sectors of the economy.	2	PO1, PSO3
CO2	Understand the nature of linkage between the agricultural sector and the industrial sector.	2	PO2, PSO3
CO3	Apply the trade and industry are complementary and mutually dependent associate with crore economics development.	3	PO2, PSO3
CO4	Apply the linkages between the industrial sector and the infrastructure of the economy growth	3	PO2
CO5	Analyses the linkages between the industrial sector and Agriculture sector.	4	PO2, PO4, PSO3

Syllabus

Introduction, Industrialisation and Structural Transformation of the Economy, kage Between Agriculture and Industry, Agriculture Contribution to the Industrial Growth , Indistrial Contribution to Agricultural Growth , Industrialisation, Domestic Trade and Transportation, , Industrialisation and Domestic Trade

Introduction Industrialisation and Productivity of Labour, Industrialisation and Generation of Employment, Industrialisation and Low Elasticity of Demand for Food Products, Industrialisation and Mobillsation of Surplus , Industrialisation and Economies of Scale , Industrialisation and Balance of Payments .

Critique of Industrialisation, Problems associated with Industrialisation , Extent and Pace of Industrialisation , Nature of Industries, Order of Priority, Locatlon of the Industries, Large and Small-Scale Industries ,

Introduction Factors Hindering Industrialisation in Developing Countries, Economic Factors, Sociodemographic Factors, Administrative Factors , International Factors ,

Industrialisation and Low Elasticity of Demand for Food Products, Industrialisation and Mobillsation of Surplus, Nature of Industries, Order of Priority, Locatlon of the Industries, Large and Small-Scale Industries ,

Reference Books

1 An Introduction to Industrial Economics (Routledge Library Editions: Industrial Economics), P.J. Devine (Author), EDITION 2, 2012, Routledge .

2 The Industrial Revolution in World History , Peter N Stern, Edition 1, 1981, Westview Press.

3 Introduction to Economic, Jones, I. Charles , Edition 2, 2014, Growth, New Delhi Viva Books Private Limited..

4 International Economics., Salvatore, D. , Edition 10 , 1992, Wiley India..

24BA3227 - ECONOMICS AND DATA ANALYTICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BA3227	ECONOMICS AND DATA ANALYTICS	EDA	R	2	1	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts of computer hardware, including components such as CPU (Central Processing Unit), RAM (Random Access Memory), storage devices (hard disk drives, SSDs), input/output devices (keyboard, mouse, monitor), and peripheral devices (printers, scanners).	2	PO1, PO10
CO2	Understand the different types of data (time series, cross section, pooled), data entry, tabulation, and graphical representation in Excel, as well as data imports and exports to application software like EViews or SPSS	2	PO5, PSO3
CO3	Apply the knowledge and skills necessary to conduct data analysis using EViews or SPSS software, including descriptive statistics, correlation analysis, and regression modeling, to inform decision-making and research in various fields.	4	PO1, PO10
CO4	Analyze and forecast time series data in various fields such as economics and finance.	4	PO5, PSO3
CO5	Apply time series analysis techniques, including autocorrelation analysis, unit root tests,Practical exercises and case studies.	4	PO1, PO5, PO10

Syllabus

Computer Fundamentals and Data Basics in Computer, Computer hardwares and softwares, Disk operating systems, Operating system, Windows, and Introduction to MS Office Word and Excel.

Different Types of Data, Time series, cross section and Pooled,Data Entry, Tabulation and Graphical Representation in Excel,Data Imports and Exports to application software Eviews, SPSS,Data tabulation and graphical representation in Eviews, SPSS.

Data Analysis in Eviews,SPSS Moments, Mean, Median and Mode,Measures of Dispersion and Skewness,Correlation and Simple Regression,Multiple Regression Analysis

Introduction to Time Series Analysis in Eviews/SPSS Stochastic Processes, Autocorrelation Functions and Correlogram, Stationarity: UnitRoot Test,Timeseries Regression Analysis, Spurious Regression,Random Walk Model and Introduction to Cointegration Analysis

Hypothesis testing: Simple, composite, null, and alternate hypotheses, level of significance, tests of significance based on chi square, t and F statistics, confidence intervals, confidence intervals for mean and variance of the normal population, confidence interval for proportions.

Reference Books

1 Fundamentals of Computers, Rajaraman, V, 1e, 2002, Prentice Hall of India.

2 Applied Econometric Time Series, Enders, W, 1e, 2014, McGraw Hill .

3 Theory and problems of data processing, Lipschultz,M M and S,Lipschultz, 1e, 1980, Schums outline series, McGraw Hill.

4 Quantitative approaches to management, Levin,R I and C A Kirkpatric, 3e, 1978, McGraw hill.

5 A First Course in Computers, Sanjay Saxena , 2e, 2010, Vikas Publishing House Pvt Ltd.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Project Research And Internship (PRI)

24IE1201 - SUMMER INTERNSHIP PROGRAM -1 (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24IE1201	SUMMER INTERNSHIP PROGRAM -1	SIP-1	R	0	0	0	8	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To apply various aspects related to initial visit	3	PO1, PSO1
CO2	To apply various aspects related to interim isit	3	PO2, PSO2
CO3	To apply various aspects related to final visit	3	PO3, PSO3
CO4	To apply various aspects related to Viva Presentation	3	PO4, PSO3

Syllabus

Orientation in the Company During the first two weeks of SIP, every intern shall undergo an extensive orientation program in the Company. During this period, the intern shall understand the company, its customers, and its competitors. The study done during this period shall help in the preparation of the 3CET report. The Intern shall thoroughly study the financial statements of the company for the past couple of years, understand the policies of the company, study the macro-environment in which the industry is operating and has to conduct a bSWOT analysis. The Intern shall also get oriented to various departments of the company and get to know the key functionaries. The Interns shall meet these functionaries with prior appointment and understand various perspectives from them in managing their departments. This provides a unique opportunity for the interns to gain insights into managing the departments directly from the head of those departments. The interns shall also get to know their Company Guide and other executives/supervisors who shall be closely guiding them during the period of SIP.

The Intern shall also understand the organizational structure and the top management team including the Chairman, Managing Director, Chief Executive Officer, etc. By the end of the orientation program in the company, the Intern should be able to clearly state his/her business objectives which would include specific and measurable targets to be achieved during the Executive Training, break-up of targets on a weekly basis, etc. The Faculty Guide shall facilitate the orientation program at the company. It is suggested that the orientation program be prepared in advance in consultation with the company authorities and circulated to the Interns for smooth implementation. Understanding the Company. The Intern should be able to understand the company as a whole by going through various departments of the company. In addition, it is important to understand the position of the company vis-a-vis the industry in which the company is operating. In trying to understand the company, the following aspects may be studied: Marketing: Product portfolio, Distribution network, Sales force, Pricing, Promotion strategies, Customer service, Marketshare, Market structure, Competition, Measurement metrics. Human Resources: Organization structure, Organogram, Senior management, Departments and Functions, Staff strength, Recruitment, Training and Development, Appraisal and Retention practices, etc. Retention issues, Measurement metrics. Operations: Functions, Processes, Facilities, Measurement metrics. Finance: Capital structure, Financial ratios, Performance metrics etc. Any other relevant

Application of concepts in sourcing the Customer During the initial period of SIP, an Intern should understand the products of the company and the customer profile. Effort should be made on various aspects of understanding the customers, their segmentation, product positioning, buying pattern, etc. Understanding the Competition The Intern is also expected to understand the competitors for the products marketed by the Company and understand the strengths, weaknesses, opportunities and threats vis-a-vis the competition. Executive Training Executive Training may stretch from the beginning to the end of SIP. During this period, the Intern would be assigned various tasks by an organization, which is part of the day-to-day functioning of the department within the organization.

Executive Training gives direct exposure to execution and support functions of the department. It gives a flavor of teamwork, organizational culture, team dynamics, result orientation, organizational pressures, complexities in achieving the desired results, etc. The Intern should take this as a learning experience and be ambitious of achieving the desired targets or accomplishing the required tasks, through professionalism and business acumen. Executive Training provides a good scope for developing the necessary managerial skills and a positive attitude in the Interns

Reference Books

1 The Complete Book Of Internships in India : Intern Abroad This Summer, Aniket Singh, First Edition, Notion Press.

2 How to Intern Successfully, Robert J. Khoury, First Edition, Waterside Productions.

3 How To Land Your Dream Internship, Tam Pham, Second Edition, CreateSpace Independent Publishing Platform .

4 The Successful Internship, H. Frederick Sweitzer & Mary A. King, Fifth Edition, Cengage Learning.

5 Internship, Practicum, and Field Placement Handbook, Brian Baird, First Edition, Routledge.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Open Elective Courses (OEC)

22FT2212R - PROCESSING OF AQUATIC FOODS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT2212R	PROCESSING OF AQUATIC FOODS	PAF	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand terminology of commercially important aquatic animals and plants used as food sources and their body structures.	2	PO7
CO2	Apply intrinsic and extrinsic factors that affect spoilage of aquatic foods.	3	PO7
CO3	Apply an understanding on processing, preservation, supply chain, and marketing aspects of such products.	3	PO7
CO4	Apply an understanding on executing preservation of select marine products.	3	PO7
CO5	Apply processing techniques of aquatic foods.	3	PO7

Syllabus

Outline of the commercial importance, definitions, classification, glossary. Sources_Animals (freshwater and seawater) fish, crustaceans, cephalopods, mollusks; Plants seaweed, water spinach; external anatomy, edible and non-edible parts, nutritional attributes, nutritional advantages versus regular plant sources.

Spoilage_Extrinsic factors (temperature, moisture, microbes, insects), intrinsic factors (physical, chemical, biochemical, physiological).

Processing_Drying_sun drying, microwave drying, ohmic heating, IR heating, ultrasound processing, enzymatic processing; salting, canning or heat processing, freezing, smoking, high pressure processing (HPP), retort, pulsed light, irradiation, electromagnetic field, etc; cold storage, refrigerated vans for transport.

Fish byproducts_Liver oil, body oil, fish meal, fish manure, fish flour, fish silage, fish soluble, fish sausage, fish macaroni, fish glue, gelatin, albumin, fish protein concentrate. Quality attributes_Nutritional value. Sensory_appearance, color, flavor, odor, and texture.

Grading, processing, and analyses of aquatic foods for their physico-chemical and nutritional properties.

Reference Books

1. Seafood Processing, Adding Value Through Quick Freezing, Retortable Packaging and Cook-Chilling., Vazhiyil Venugopal, 1 (2006), CRC Press.
2. Quality Assurance in Seafood Processing: A Practical Guide, A. David Bonnell, 1 (1994), Springer.
3. The Seafood Industry: Species, Products, Processing, and Safety, Roy E. Martin, Linda Ankenman Granata, George J. Flick Jr., 2 (2012), Springer.
4. Seafood Research from Fish to Dish: Quality, Safety and Processing of Wild and Farmed Fish, J. B. Luten, C. Jacobsen, K. Bekaert, A. Saebo, J. Oehlenschlager, 1 (2006), Wageningen Academic Publishers.

22FT22C1R - FOOD ANALYSIS AND QUALITY ASSURANCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT22C1R	FOOD ANALYSIS AND QUALITY ASSURANCE	FAQA	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Summarize the analytical aspects of foods in quality and regulatory perspective.	2	PO1, PO7, PO9, PSO3
CO2	Apply the analytical methods for chemical and nutritional properties of foods.	3	PO1, PO7, PO9, PSO3
CO3	Apply the analytical methods for thermal and rheological properties of foods.	3	PO1, PO7, PO9, PSO3
CO4	Apply the sensory and microbiological analysis methods for different processed foods	3	PO1, PO7, PO9, PSO3
CO5	Analyze the project on Quality assurance.	4	PO1, PO7, PO9, PSO3

Syllabus

Introduction to Food Analysis, Importance of various food components, purpose, sampling requirements. Quality different aspects of food analysis, Properties, parameters, methods, techniques. Regulatory aspects involved in the food analysis.

Chemical and Physico-Chemical analysis of foods, Chemical analysis such as carbohydrate, protein, fat, mineral content analysis. Study on different physical properties such as colour, size, shape, composition and interfacial properties.

Different Thermal and Rheological Properties. Thermal properties such as transition (glass and melting) and degradation temperatures, thermal conductivity, specific heat and thermal diffusivity of different foods. Different rheological properties such as flow properties, studies on shear stress and shear rate in different foods.

Study on microbial effect in different types of foods. Study on microbial diseases transmitted through foods. Study of different sensory parameters, study on advanced sensory software tools. Study on advanced microbiological techniques.

Evaluate the project on Quality analysis including Practical Safety evaluation of foods for heavy metal content and pesticides residue, Analyse the water activity in different foods, Analyse the texture of different foods, Analyse the quality parameters of water, Evaluate the thermal properties of different foods, Analyse the flow properties of different foods, Evaluate the microbial quality of selected food products.

Reference Books

1 Handbook of Food Analysis Instruments , Semih Otles, 1st Edition, 2009, CRC Press.

2 Instrumental Methods in Food and Beverage Analysis , David L. B. Wetzel, George Charalambous , 1st Edition, 1998, Elsevier.

3 Vitamin Analysis For The Health And Food Sciences , Ronald Ray Eitenmiller, Lin Ye, W. O. Landen , 2nd Edition, 2007, CRC Press.

4 Methods of Analysis of Food Components and Additives , Semih Otles , 2nd Edition, 2012, CRC Press.

23ACCABT - BUSINESS TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ACCABT	BUSINESS TECHNOLOGY	BT	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To understand business organization types, structure, functions and governance	2	PO1
CO2	To apply the accounting reporting systems, control and compliance	3	PO1, PSO2
CO3	To apply the knowledge in professional ethics in accounting and business	3	PO4
CO4	To develop personal effectiveness and communication	3	PO6

Syllabus

The business organisation, its stakeholders and the external environment -The purpose and types of business organisation, Stakeholders in business organisations, Political and legal factors affecting business, Macroeconomic factors, Micro economic factors, Social and demographic factors, Technological factors, Environmental factors, Competitive factors. Business organizational structure, functions and governance The formal and informal business organisation, Business organizational structure and design, Organizational culture in business, Committees in business organisations, Governance and social responsibility in business.

Accounting and reporting systems, controls and compliance - The relationship between accounting and other business functions, Accounting and finance functions within business organisations, Principles of law and regulation governing accounting and auditing .The sources and purpose of internal and external financial information, provided by business, Financial systems, procedures and related IT applications, Internal controls, authorization, security of data and compliance within business, Fraud and fraudulent behaviour and their prevention in business, including money laundering.

The sources and purpose of internal and external financial information, provided by business, Financial systems, procedures and related IT applications, Internal controls, authorization, security of data and compliance within business, Fraud and fraudulent behaviour and their prevention in business, including money laundering.Professional ethics in accounting and business Fundamental principles of ethical behaviour, The role of regulatory and professional bodies in promoting ethical and professional standards in the accountancy profession, Corporate codes of ethics, Ethical conflicts and dilemmas.

Leading and managing individuals and teams Leadership, management and supervision, Recruitment and selection of employees, Individual and group behaviour in business organisations, Team formation, development and management, Motivating individuals and groups, Learning and training at work, Review and appraisal of individual performance.Leading and managing individuals and teams Leadership, management and supervision, Recruitment and selection of employees, Individual and group behaviour in business organisations, Team formation, development and management, Motivating individuals and groups, Learning and training at work, Review and appraisal of individual performance.Competence frameworks and personal development, Sources of conflicts and techniques for conflict resolution and referral, communicating in business.

Reference Books

1 Accountant in Business - BPP Learning Media, BPP Learning Media, BPP Learning Media 2010, BPP Learning Media.

2 INFORMATION TECHNOLOGY IN BUSINESS MANAGEMENT, MUKESH DUNNA, J.B. DIXIT, First Edition Publication Date 1 January 2015, Laxmi Publications Edition .

3 Emerging Technological in Global Business Environment, DR.SAROJA KUMAR, Paperback 1 January 2022, THAKUR PUBLICATION PRIVATE LTD.

4 Technology, Management And Society, PETER F.DRUCKER , 2023, T&F INDIA.

23ACCAFA - FINANCIAL ACCOUNTING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ACCAFA	FINANCIAL ACCOUNTING	FA	R	3	2	0	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the context and purpose of financial reporting, The scope and purpose of financial statements for external reporting,	2	PO2
CO2	Apply the use of double-entry and accounting systems, Preparing simple consolidated financial statements	3	PO5
CO3	Apply impart knowledge in preparation of trial balance, Calculate goodwill (excluding impairment of goodwill) using the full goodwill method only	3	PO5
CO4	Demonstrate control accounts and incomplete records, Interpretation of financial statements - Importance and purpose of analysis of financial statements Describe how the interpretation and analysis of financial statements is used in a business environment,	3	PO7

Syllabus

The context and purpose of financial reporting The scope and purpose of financial statements for external reporting, Users and stakeholders needs, The main elements of financial reports, The regulatory framework (legislation and regulation, reasons and limitations, relevance of accounting standards), Duties and responsibilities of those charged with governance. The qualitative characteristics of financial information The qualitative characteristics of financial information. The use of double entry and accounting systems Double entry book keeping principles including the maintenance of accounting records and sources of accounting information, Ledger accounts, books of prime entry, and journals. Recording transactions and events Sales and purchases, Cash, Inventory, Tangible noncurrent assets, Depreciation, Intangible noncurrent assets and amortization, Accruals and prepayments, Receivables and payables, Provisions and contingencies, Capital structure and finance costs. Preparing a trial balance Trial balance, Preparing basic financial statements of financial position, Statements of profit or loss and other comprehensive income, Disclosure notes, Events after the reporting period, Statements of cash flows, incomplete records.

Preparing simple consolidated financial statements Subsidiaries Define and describes the following terms in the context of group accounting: Parent, Subsidiary, Control, Consolidated or group financial statements, Noncontrolling interest, Trade simple investment. Identify subsidiaries within a group structure. Describe the components of and prepare a consolidated statement of financial position or extracts thereof including: Fair value adjustments at acquisition on land and buildings (excluding depreciation adjustments), Fair value of consideration transferred from cash and shares (excluding deferred and contingent consideration), Elimination of intra-group trading balances (excluding cash and goods in transit), Removal of unrealised profit arising on intra group trading, Acquisition of subsidiaries part way through the financial year,

Calculate goodwill (excluding impairment of goodwill) using the full goodwill method only. Describe the components of and prepare a consolidated statement of profit or loss or extracts there of including Elimination of intra-group trading balances (excluding cash and goods in transit), Removal of unrealised profit arising on intra group trading, Acquisition of subsidiaries part way through the financial year. Associates Define and identify an associate and significant influence and identify the situations where significant influence or participating interest exists, Describe the key features of a parent-associate relationship and be able to identify an associate within a group structure, Describe the principle of equity accounting.

Interpretation of financial statements - Importance and purpose of analysis of financial statements Describe how the interpretation and analysis of financial statements is used in a business environment, explain the purpose of interpretation of ratios. Ratios Calculate key accounting ratios Profitability, Liquidity, Efficiency, and Position. Explain the interrelationships between ratios. Analysis of financial statements Calculate and interpret the relationship between the elements of the financial statements with regard to profitability, liquidity, efficient use of resources and financial position, Draw valid conclusions from the information contained within the financial statements and present these to the appropriate user of the financial statements

Reference Books

1 FINANCIAL ACCOUNTING, SP JAIN & KL NARANG, 15, 2005, KALYANI.

2 FINANCIAL ACCOUNTING, KAPLAN , 16, 2010, KAPLAN ACCA.

3 FINANCIAL ACCOUNTING, BHUSHAL KUMAR GOYAL, 18, 2022, TAXMAN.

4 FINANCIAL ACCOUNTING, DR SM SUKLA, 16,2020, SAHITHYA BHAWAN PUBLISHERS.

23AD2204R - DATA MANAGEMENT AND WAREHOUSING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD2204R	DATA MANAGEMENT AND WAREHOUSING	DMW	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Design a Data warehouse system and perform business analysis with OLAP tools	2	PO1, PO2, PO3, PSO2
CO2	Apply suitable pre-processing and visualization techniques for data analysis	3	PO2, PO3, PO4, PSO2
CO3	Discover frequent pattern and association rule mining techniques for data analysis	3	PO1, PO2, PO3, PSO2
CO4	Apply appropriate classification techniques for data analysis	3	PO1, PO2, PO3, PSO2
CO5	Discover appropriate clustering techniques for data analysis	3	PO1, PO2, PO3, PSO2

Syllabus

UNIT I Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP): Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Database Architectures for Parallel Processing, Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, Pattern Mining in Multilevel, Multi-Dimensional Space Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

Classification: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy, Clustering: Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical methods, Density Based Methods, Grid Based Methods, Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis, outlier detection methods.

Reference Books

1 Data Warehousing, Data Mining & OLAP, Alex Berson and Stephen J Smith, 35th reprint 2016, Tata McGraw Hill.

2 Data Mining concepts and Techniques, Han, Kamber, 2nd Edition, Hk.

3 Introduction to Data Mining, Pang Ning Tan, 1st Edition, Pearson.

4 Data Mining and Analysis - Fundamental concepts and Algorithms, Mohammad J Zaki, 1st, Oxford .

5 Insight into Data Mining Theory and Practical, K P soman, shyam Diwakar, 2006, Prentice Hall of India.

23AD3106R - BIG DATA ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD3106R	BIG DATA ENGINEERING	BDE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply big data use cases from selected business domains.	3	PO1, PO2, PSO1, PSO2, PSO3
CO2	Construct NoSQL big data management	3	PO3, PO5, PSO3
CO3	Install, configure, and run Hadoop and HDFS	4	PO2, PO4, PO6, PSO2, PSO3
CO4	Perform map-reduce analytics using Hadoop	4	PO4, PO7, PSO3
CO5	Implement the lab experiments for big data application	5	

Syllabus

A distributed system uses multiple independent computers to enhance scalability, reliability, and performance compared to centralized systems. It distributes tasks across nodes, reducing failure risk and boosting processing speed but adds complexity in data consistency, communication, and security. Big Data involves vast, rapidly generated data that traditional systems can\'t handle. Distributed technologies like Hadoop and Spark manage this data effectively, driven by trends such as the internet and IoT, with cloud platforms offering scalable solutions for better decision-making and strategic advantages.

Big Data engineering has evolved with NoSQL databases, which address SQL limitations in scalability and flexibility. NoSQL databases handle diverse, unstructured data with schema-less models and manage relationships with graph databases. They use distribution methods like replication and sharding to ensure high availability and performance. Hadoop, including HDFS and MapReduce, supports distributed storage and processing, driving effective Big Data management and insights.

Hadoop is a framework for distributed storage and processing of large datasets using the MapReduce model, with its HDFS ensuring reliability and scalability. It supports various data formats and interfaces. Apache Spark complements Hadoop by speeding up data processing with in-memory computation using RDDs. Together, they are crucial for Big Data analytics, helping organizations extract insights from massive datasets.

MapReduce workflows involve splitting data into smaller chunks for parallel processing in the "map" phase, followed by aggregation in the "reduce" phase. MR-Unit allows for unit testing MapReduce logic with local test data. A MapReduce job run includes input splitting, mapping, shuffling, sorting, and reducing. Classic MapReduce and YARN handle job execution and resource management, with YARN providing enhanced scalability. Failures are managed through built-in recovery mechanisms. Job scheduling prioritizes tasks, while shuffle and sort organize intermediate data. MapReduce supports various input and output formats for flexible data processing.

Setting up a Hadoop environment starts with installing VMware to create virtual machines for Hadoop components like HDFS and YARN. Basic Linux commands are used to manage files in HDFS. Running a word count MapReduce program helps understand parallel data processing, while more complex tasks like temperature analysis or patent record processing showcase MapReduce\'s capability. Features like Partitioner for workload optimization and tasks such as averaging or matrix multiplication highlight Hadoop\'s versatility in distributed computing.

Reference Books

1 Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Michael Minelli, Michele Chambers, Ambiga Dhiraj , 3rd, 9 January 2013, Wiley.

2 DW 2.0: The Architecture for the Next Generation of Data Warehousing, W.H. Inmon, Derek Strauss, Genia Neushloss, 1st Edition, 2008, Publisher Morgan Kaufmann.

3 Agile Data Warehouse Design: Collaborative Dimensional Modeling, from Whiteboard to Star Schema Paperback, Jim Stagnitto , Lawrence Corr, 1st Edition, 2011, DecisionOne Press.

4 Big Data:Principles and best practices of scalable realtime data systems Paperback, James Warren , Nathan Marz, 1st Edition, 2015, Manning Publications.

23BT2209R - BIOCHEMICAL REACTION ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT2209R	BIOCHEMICAL REACTION ENGINEERING	BCRE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply principles of biochemical Reaction Engineering to interpret chemical or biological reaction kinetics	3	PO1
CO2	Interpret batch reactor data analysis to asses order, half life and rate constant of reaction system	3	PO1, PO2
CO3	Apply principles of bioreactor systems to asses rate of substrate utilization, biomass and product formation	3	PO1
CO4	Apply principles of CSTR systems to analyze cell concentration and substrate concentration and related microbial kinetic parameters	3	PO1
CO5	Analysis of chemical and biological kinetics to asses the progress of reaction system for improving better biomass and product formation	4	PO2, PSO2, PSO3

Syllabus

Over View of Biochemical Reaction Engineering: Overview of biochemical reaction Engineering; Classification of reactions;Reaction rate;Kinetics of homogenous reactions; Single and multiple reactions; Elementary and Non elementary reactions; Molecularity and order ofreactions; rate constant;Kinetic models of non-elementary reactions; Temperature dependency of rate equation.

Constant volume batch reactor;Analysis of total pressure data; The conversion; Integral method of analysis of data; Irreversible uni-molecular, bimolecular reactions; Zero order reactions. Half-life of a reaction; Varying volume batch reactor; differential method of analysis; Integralmethod of analysis; Zero order; First order & second order reactions;Temperature & reaction rate.

Definitions;Differences and similarities between chemical and bioreactors; Classification of bioreactors;Reactor configurations; Description of a conventionalbioreactor with all aspects; Design and construction criteria of a bioreactor; Concept of ideal and nonidealreactors; Residence time distribution;stimulus response technique; Models of non- ideal reactors; Imperfect mixing.

Designing Of Bioreactors: Design equationsfor enzymereactors; batch growth of microorganism; Design equation of a plug flow reacto,Design of CSTR with wash out concept; Stirred tank reactors withrecycle of biomass; Continuous stirred tank fermenters in series with out and with recycle of biomass; Estimation of kinetic parameters.

Esimation of mixing time, estimation of Volumetric mass transfer (Kla) in sparged reactor, Estimation of gas hold up in sparged bioreactor, estimation of power number number and power consumption for various impellors, interpretation of batch reactor data,CSTR kinetics, RTD studies, PFR kinetics, Reaction studies on airlift reactor

Reference Books

1 Fundamentals of Biochemical Engineering, Bailey & Ollis,, 2, Mcgraw Hill Higher Education, 2017.

2 Chemical Reaction Engineering, Octave Levenspie, 3, Wiley India pvt. Ltd,1998.

3 Bioprocess Engineering Principles, Pauline M Doran., 2, Elsevier, 2013.

4 Biochemical Engineering, D. G. Rao., 2, McGraw-Hill, 2009.

23BT3212 - PLANT AND ANIMAL BIOTECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT3212	PLANT AND ANIMAL BIOTECHNOLOGY	PABT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the principles of plant tissue culture, protoplast culture in generating somatic hybrids Plant tissue culture and protoplast culture are key techniques in plant biotechnology that facilitate the generation of somatic hybrids.	3	PO1
CO2	Apply plant tissue culture techniques to understand the methods in producing transgenic plants for Selection of Explants, Preparation of Culture Media, Genetic Transformation Methods.	3	PO1, PO3
CO3	Analyze the role of animal tissue culture methods in maintaining cell lines providing a controlled environment for the study of cellular processes, drug development, and therapeutic applications.	3	PO1
CO4	Apply the principles of Gene transfer methods in understanding the significance of Transgenic animals which have numerous applications in biomedical research, agriculture, and biotechnology.	3	PO1, PO3
CO5	Analyse the results of tissue culture techniques in producing invitro cultured plants, metabolites and cell line maintenance reveals significant advancements in plant and animal biotechnology.	3	PO1, PO4, PO5, PSO3

Syllabus

Plant tissue culture: Totipotency of plant tissue; Conservation of plant germplasm; Germplasm preservation-Cryopreservation; Plant Tissue CultureSterilization, composition of MS media, Media Preparation; Callus culture, Organogenesis, Somatic embryogenesis, Meristem culture, Haploid production (Anther,Pollen/Ovary,Ovule); Micropropagation, hardening and Green House Technology; Protoplast isolation and fusion- Cybrid Production; Artificial/synthetic seeds; Production of Secondary Metabolites.

Genetic engineering in Plants: Agrobacterium-mediated DNA transfer- Ti/Ri plasmid Vectors- Binary and co-integrated vectors; Transformation strategies in plants- Agrobacterium tumefaciens, Physical methods of gene transferElectroporation and gene gun methods; Chloroplast transformation; Molecular biology of plant-pathogen interactions and application of gene transfer techniques in pest resistance (Bt genes), edible vaccines, and Delayed fruit ripening; Ethical issues in plant biotechnology.

Animal cell culture: Facilities and Applications- Media for Animal cells; Types of cell culture- Primary cell culture, secondary culture, cell transformation, cell lines, Insect cell lines, stem cell cultures, cell viability, and cytotoxicity; Biology of cultured cells, measurement of growth, cell synchronization, senescence, and apoptosis; Organ culture; Cryopreservation; Human embryonic Stem Cells.

Genetic engineering in animals: methods of DNA transfer into animal cells- calcium phosphate co-precipitation, , microinjection, electroporation, Liposome encapsulation, Biological vectors.Hybridoma technology; Vaccine production;Transgenic animals

Reference Books

1 Plant Biotechnology, C. Chawla., 2004, Oxford.

2 IBH and Animal cell culture Practical approach , Ed. John R.W. Masters, 2000, Oxford.

3 Cell growth & Division, Morgan, D. O., 2007, New Science Press.

4 An Introduction to Plant Tissue Culture, MK Razdan., 2019, Oxford and IBH.

23CE2208R - GEOTECHNICAL ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2208R	GEOTECHNICAL ENGINEERING	GTE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply and Describe soils and determine their physical characteristics of given soils..	3	PO1, PO6, PSO1
CO2	Apply the soils and determine their compaction characteristics and engineering characteristics of soil	3	PO1, PO6, PSO1
CO3	Apply the load carrying capacity of pile various soils and methods ,Determine the lateral earth pressure, stability of slopes and retaining walls.	3	PO1, PO6, PSO1
CO4	Apply the soil sample investigation and bearing capacity at various conditions and settlement, total stress and effective stress methods of analysis to evaluate slope stability. and detailing of well foundations	3	PO1, PO6, PSO1
CO5	Demonstration about Soil general and engineering properties using Geotechnical Engineering laboratory.	3	PO1, PO6, PSO1

Syllabus

Origin of Soils: Soil Origin, rock cycle. Phase Relations: Weight Relationships, Volume Relationships, Density and Unit Weight Relationships, Inter-relationships. Soil Classification: coarse grained soils, fine grained soils. IS soil classification Compaction: variables in compaction, laboratory tests, field compaction, specification and control. Effective Stress: Effective stress Principle, effective stress, pore water pressure, and total stress variation with depth, vertical normal stress due to overburden, capillary effects in soils.

: Permeability of stratified soil deposits, Indirect methods, Factors affecting permeability; SEEPAGE: Laplace Equation, Estimation of seepage using flownet; INSITU STRESSES: Total stress, Pore Water Pressure, Effective Stress, seepage forces, quicksand condition; STRESSES IN A SOIL MASS: Vertical stress distribution using Boussinq equation, Fadum Chart and Newmarks chart, consolidationand compaction of soil ,shear strength of soil.

Pile Foundations: Use of piles, Types of piles, Construction, Selection of pile type, Types of foundations to suit subsoil conditions, Pile load capacity, Static formulae, Dynamic formulae, Load tests, on piles, Group action of piles, Load carrying capacity of pile groups, Negative skin friction, Piles subjected to uplift loads Well Foundations: Types of wells and caissons, components of well foundation, shapes of wells, depth of a well foundation, forces acting on a well foundation.

SUBSOIL INVESTIGATION: Depth of Exploration, Methods of Exploration, Borings for exploration, Depth of exploration, Methods of exploration, Borings for exploration, Field tests Plate load test, Penetration test. SHALLOW FOUNDATIONS: Types of foundations and choice of foundations, Bearing capacities, Terzaghs bearing capacity theory, influence of water table on bearing capacity, safe bearing capacity of soil using IS Code: SETTLEMENT OF FOUNDATIONS: Settlement of shallow foundation, Allowable bearing pressure of granular soils based on standard penetration test value.

Reference Books

1 Geotechnical Engineering, N Sivakugan and Braga M Das, 2009, J. Ross publishing..

2 Basic and Applied Soil Mechanics, Gopal Ranjan and ASR Rao, , 2007., New Age International Publishers.

3 Foundation Analysis and Design, J.E. Bowles, 2009, MacGraw Hill, 1996.

4 Soil Mechanics and Foundation Engineering, V. N. S. Murthy's, 2002, CBS Publishers & Distributors Pvt. Ltd.

23CE2209R - TRANSPORTATION ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2209R	TRANSPORTATION ENGINEERING	TPE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the Current road projects including highway project preparation	2	PO1, PO3, PSO3
CO2	Design highway cross section elements	3	PO1, PO3, PSO3
CO3	Design flexible and rigid pavement	3	PO1, PO3, PSO3
CO4	Analyse the components of traffic stream parameters	3	PO1, PO3, PSO3
CO5	Identify the suitable road construction materials following IRC codes	3	PO1, PO3, PSO3

Syllabus

Highway Network Planning: Different modes of transportation, role of highway transportation, classification, network patterns, planning surveys, preparation of plans, final report, master plan, evaluation by saturation system, Various road development plans, salient features, introduction to highway economics.

Highway Alignment And Geometric Design: Principles of highway alignment, requirements, controlling factors, engineering surveys, importance of geometric design, design controls and criteria, cross section elements, pavement surface characteristics, camber, carriageway, kerbs, road margins, formation, right of way, typical cross sections, sight distance, stopping sight distance, overtaking sight distance, sight distance at intersections, design of horizontal alignment, super elevation, transition curves, design of vertical alignment, gradients, vertical curves.

Pavement Materials and Mix Design: Types of pavement structures, functions of pavement component layers, materials used in pavements, basic soil properties relevant to pavement applications, properties of aggregate, blending of aggregates, tests on bitumen, grading of bitumen, bituminous mix design using Marshall method. Design of Pavements: Stresses in flexible pavements: layered system concepts, stress solution for one, two and three layered systems, fundamental design concepts; variables considered in pavement design: axle types, standard and legal axle loads, ESWL, EWLF, vehicle damage factor, ADT, AADT, growth factor, lane distribution factor, directional distribution factor, tyre pressure, contact pressure, design life

Traffic Engineering Principles: Traffic characteristics; components of traffic stream: flow- speed Density, measurement and analysis, q-k-v relationships, design hourly volume, concept of EPCU, capacity and level of service, parking studies and road safety

Reference Books

1 Transportation Engineering: Planning and Design, Paul H. Wright, Norman J. Ashford, 1998, Wiley.

2 Traffic and Highway Engineering, Nicholas J. Garber, Lester A. Hoel, 2014, Cengage Learning.

3 Transportation Engineering: An Introduction, C. Jotin Khisty and B. Kent Lall, 2002, Pearson.

4 Principles of Highway Engineering and Traffic Analysis, Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski, 2020, John Wiley.

23EC2208R - DIGITAL COMMUNICATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2208R	DIGITAL COMMUNICATION	DC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand working of waveform coding techniques and their performance.	2	PO2, PSO2
CO2	Apply the knowledge of signals and system and evaluate the performance of digital communication system in the presence of noise.	3	PO2, PSO2
CO3	Analyze the generation and detection of different digital carrier modulation techniques.	4	PO2, PSO2
CO4	Evaluate the benefits of spread spectrum techniques and assess the performance of spread spectrum systems	4	PO2, PSO2
CO5	Analyze the different modulation techniques, pulse coding techniques and spread spectrum techniques in digital communication systems using simulation tools and SDR hardware via GNU Radio.	4	PO2, PSO2

Syllabus

"Baseband signals. Sampling process; Concepts on PAM, PWM and PPM. Quantization Process; Quantization Noise; Linear and Non-linear PCM codes, Noise Considerations in PCM Systems; PCM Line Speed, DPCM, Delta Modulation (DM) and Adaptive DM."

"Eye diagrams, Characterization of Bandlimited Channels, Optimum Receiver for the AWGN Channel, Detection of Baseband Signals in Noise, Matched filter, Other binary signal transmission and antipodal signals., The Power Spectrum of a Digital PAM Signal, Inter symbol Interference: System Design for Bandlimited Channels. Raised Cosine spectrum,"

"Concepts on measure of Information: Bits, Bit Rate, Baud, and M-ary Encoding Noiseless coding-Huffman coding, Channel capacity, Hartley Shannon law Source coding theorem, channel coding, ASK, PSK, FSK, QAM. Bandwidth Efficiency, Carrier and Clock Recovery,Probability of Error and Bit Error Rate, Error Performance."

"Pseudo-noise sequences, notion of spread spectrum, Direct Sequence Spread Spectrum (DSSS) with coherent BPSK, Signal space, dimensionality and processing gain, Probability error"

Reference Books

1 Communication Systems , Simon Haykin. , 3, Wiley India Pvt. Limited. .

2 Advanced Electronic Communication Systems , Wayne Tomasi , 5, Pearson .

3 Digital communications , Proakis, J. G. , 1, Mc Graw Hill .

4 Digital Communicaions , Dr Muralidhar Kulkarni , 1, AICTE .

23EC2211R - VLSI DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2211R	VLSI DESIGN	VLSID	R	3	0	2	2	4.5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Realize MOS device with transient and DC characteristics	3	
CO2	Understand the characteristics of CMOS inverter	3	
CO3	Analyze the static and dynamic characteristics of CMOS circuits	4	
CO4	Analyze the performance of CMOS circuits	4	PO2, PO5
CO5	Design and analyze the combinational and sequential circuits using Cadence VLSI Design Full Suite	4	PO2, PO5, PSO2, PSO3
CO6	Design and analysis of VLSI circuits for real time applications.	4	PO6, PSO2, PSO3

Syllabus

MOS Transistor Theory: Introduction to the metal oxide semiconductor (MOS) structure, Long-channel I-V characteristics, C-V characteristics, non-linear I-V effects, and DC transfer characteristics. CMOS Process Technology: Fabrication process flow- basic steps, the CMOS n-Well process, layout design rules, stick diagram, full-custom mask

Circuit Characterization and Performance Estimation: Introduction, Delay Estimation, Logical effort and transistor sizing, power dissipation, interconnect, design margin, reliability, scaling. MOS Inverters: Resistive load, depletion load, enhancement load, CMOS inverter, Static and Dynamic characteristics

Combinational CMOS Logic Circuits: MOS logic circuits with depletion nMOS loads, MOS Inverter - Static Characteristics, Switching Characteristics, and Interconnects effects, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates), ratioed, dynamic and pass transistor logic circuits.

Sequential MOS logic circuits: Behavior of bi-stable elements, SR latch circuits, clocked latch and flip-flop circuits, CMOS D-latch, and edge-triggered flip-flop. Timing path, Setup time and hold time static, an example of setup and hold time static, setup and hold slack, clock skew and jitter, Clock, reset, and power distributions. Memory Design, SRAM, DRAM structure, and implementations.

Reference Books

1 Principles of CMOS VLSI Design: A System Perspective ectrical Circuit Theory and Technology, N. H. E. Weste and C. Harris, 2007, Pearson.

2 Digital Integrated Circuits: A Design Perspective, J. Rabaey, A. Chandrakasan and B. Nikolic, 2004, Prentice Hall.

3 Basic VLSI design, Pucknell, Douglas A., and Kamran Eshraghian, 1994, Prentice Hall.

4 CMOS digital integrated circuits, Kang, Sung Mo, and Yusuf Leblebici, Kang, Sung Mo, and Yusuf Leblebici, MacGrawhill.

23IN2102 - ELECTRONIC DEVICES AND INTEGRATED CIRCUITS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23IN2102	ELECTRONIC DEVICES AND INTEGRATED CIRCUITS	EDAIC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the knowledge of Semiconductor physics and discuss BJT configurations and its applications	3	PO1, PSO2
CO2	Apply the limitations of BJT and discuss the characteristics and applications of Field Effect Transistors	3	PO1, PSO2
CO3	Analyze the linear and nonlinear circuits approaches and realize the characteristics of operational Amplifiers	4	PO1, PO2, PSO2
CO4	Apply the knowledge of internal structure, operation and applications of different ICs	3	PO1, PSO2
CO5	Design and analyze analog circuits for real-time applications using Passive and Active Components	4	PO2, PO3, PO5, PSO2

Syllabus

The construction working and characteristics of BJTs, including DC load line analysis with the help of biasing and stability of operating point, the design of BJT amplifiers along with the small signal models

The construction working and characteristics of JFET like pinch-off voltage, drain saturation current, including the JFET biasing and amplification. Types of Metal Oxide Semiconductor Field Effect Transistor (NMOS, PMOS, CMOS) with their application.

Integrated circuits basics along with Ic741 and IC555 with the different operating modes and their application in arithmetic circuits, filters, oscillators, and multivibrators.

78xx/79xx voltage regulators used for maintaining stable voltage levels. Sample & hold circuits for capturing and holding analog signals, DAC and ADC for converting between digital and analog signals, and more complex devices such as CPLDs and FPGAs.

Reference Books

1 Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 2021, Wiley.

2 Electronic Devices - Electron Flow Version, Thomas L. Floyd , 2017, Pearson.

3 Op-Amps and Linear IC Applications, Ramakanth A. Gaykwad , 2021, Wiley.

4 Digital Design: Principles and Practices, Wakerly J.F., 2016, Pearson.

23IN2203 - WIRELESS TECHNOLOGIES FOR IOT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23IN2203	WIRELESS TECHNOLOGIES FOR IOT	WTIOT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply RF spectrum analysis techniques to assess and optimize wireless communication systems	3	PO1
CO2	Apply knowledge of various wireless personal area network technologies, including Bluetooth, UWB, and ZigBee, to implement efficient sensor networks.	3	
CO3	Apply the IEEE 802.11 standards to enhance WLAN connectivity and quality of service, including power-saving mechanisms.	3	
CO4	Illustrate the various cellular standards	2	
CO5	Design and Analyse various analog and digital communication circuits	4	

Syllabus

Introduction to Wireless Communications Systems: RF &Spectrum Analysis of RF Environment, communication -Analog and Digital communication. Factors affecting network : range and speed ,Environment ,Line-of- sight ,Interference ,Defining ,CDMA and OFDM.

WSN & WPN: Wireless Personal Area Networks, Bluetooth, Bluetooth Standards, Bluetooth Protocol Architecture, UWB, IEEE 802.15standards, ZigBee, Sensor Networks, co-existence strategies in Sensor Networks, Routing protocols in Wireless Sensor Networks

Organizations and Standards: IEEE,Wi-FiAlliance,WLANConnectivity,WLANQoS&Power-Save,IEEE802.11 Standards,802.11-2007,802.11a/b/g,802.11e/h/I,802.11n. Introduction to wireless sensor Networks, Advantages of ad-hoc/sensor networks, Unique constraints and challenges. Applications Platforms for WSN.

Cellular Standards: Cellular carriers and Frequencies, Channel allocation, Cell coverage, Cell Splitting, Microcells, Picocells, Handoff; Evolution of Cellular system architecture from 2G to 5G, Frequency bands for new radio, RAN architectures, frame structure, 5G Core architecture.

Reference Books

1 Communication Systems,Simon , Simon Haykin, , 3Rd Edition, Wiley India Pvt.Limited.

2 Advanced Electronic Communication Systems, Wayne Tomasi , 5th Edition, Pearson.

3 Wireless Communications - Principles and Practice , Theodore S Rappaport ,, 2nd Edition, Pearson Education Pte. Ltd.

4 Mobile and cellular telecommunication, William C.Y. Lee,, 2nd Edition, , TATA McGRAW-HILL .

23ME2106R - MECHANICS OF SOLIDS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME2106R	MECHANICS OF SOLIDS	MOS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze stresses in members with axial loading or torsion?	4	PO5, PO7
CO2	nalyze members with multi axial loading and lateral loading?	4	PO5, PO7
CO3	Analyze deflections and stresses in beams?	4	PO5, PO7
CO4	Analyse columns and pressure vessels?	4	PO5, PO7
CO5	Apply the theoretical concepts to conduct various experiments of strength of materials practically and analyze the data?	4	PO5, PO7

Syllabus

Introduction to Stress, Strain, Hooke\'s law, Stress-strain diagram, force-deformation relationship, compound bar, Thermal Stress, Torsion of Circular bar, Strain energy

Multi axial stresses and strains: Multi-axial Stress and Strain- Relationships, Stress and Strain Transformations and Principal Stresses, Graphical representation of Stress: Mohr\'s circle. Failure of Materials and Examples, Theories of Shearing Forces and Bending Moments: Shear Force and Bending Moment, Relationship Between Load, Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams.?

eam Deflection, Symmetry, Superposition, and Statically Indeterminate Beams. Beams: Normal Stresses in Beams, Cross Section Shapes of Beams, Shear Stresses in Rectangular Beams, Shear Stresses in The Webs of Beams with Flanges.?

Thin-walled Pressure Vessels: Understand hoop and longitudinal stresses. Simple problems for cylinders and shells. Columns: Buckling, Euler\'s formula, limitations, generalized buckling.

Reference Books

1 Mechanics of Materials , Gere & Goodno , 9th, Cengage Publishers .

2 Mechanics of Materials , RC Hibbeler , 10th, Pearson .

3 Mechanics of Materials , E.P. Popov , 4th, Prentice Hall Publications .

4 Strength of Materials , S. Ramamrutham , 5th, Dhanpat Rai Publications .

5 Strength of Materials , S.S. Rattan , 3rd, S.S. Rattan .

23ME2116 - FLUID MECHANICS & HYDRAULIC MACHINES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME2116	FLUID MECHANICS & HYDRAULIC MACHINES	FMHM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the knowledge of fluid properties and the laws of fluidstatics to estimate the total pressure, Centre of pressure andforces on submerged and floating bodies	3	PO1
CO2	Apply continuity, Euler and Bernoulli equations and estimatedifferent flow measuring devices	3	PO1
CO3	Apply continuity, Euler and Bernoulli equations and estimatedifferent flow measuring devices	4	PO1
CO4	Analyze the performance of hydraulic turbines and pumps usingvelocity triangles and model similitude.	4	PO1
CO5	Conduct experiments to verify and apply various fluid flowprinciples and performance evaluation of various hydraulicmachines like turbines and pumps	4	PO1

Syllabus

Fluid Properties: Definition of fluid, properties of fluid -density, specific weight, specific gravity,viscosity, classification of fluids, surface tension and capillarity Vapour pressure. Fluid Statics

Fluid kinematics:Introduction, types of fluid flow, Discharge, Continuity equation,

Flow through pipes: Introduction, major and minor energy losses,friction coefficient in laminar and turbulent flow, Hagen-Poiseuille law

Hydraulic Machines-Turbines: Introduction, types and classification Pelton wheel,Francis turbine, Kaplan turbine

Definition of pump, classification, description and general principle of working; priming, work done and efficiency of a centrifugal pump, minimum starting speed, cavitation in centrifugal pumps, multi-stage pumps, problems on centrifugal pumps.

Reference Books

1 Fluid Mechanics and Hydraulic Machines, R.K. Bansal, 3, 2012, Mc Graw Hill.

2 Fluid Mechanics, S. K. Som and G. Biswas, 4, 2009, Tata McGraw Hill publications.

3 Fluid Mechanics, Yunus A. Cengel, 3, 2012, McGraw Hill publications.

4 Fluid Mechanics and Hydraulic Machines, D. S. Kumar, 3, 2020, Narosa PublishingHouse Private Limited..

23OEEE03 - ELECTRICAL POWER ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23OEEE03	ELECTRICAL POWER ENGINEERING	EPE	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand working of various generating stations and economical aspects of generation	2	PO2, PO10
CO2	Apply the kirchhoffs laws to calculate the electrical parameters in the given networks	3	PO2, PO10
CO3	Apply the faraday\'s laws for the construction and performance analysis of different types of electrical machines	3	PO2, PO10
CO4	Apply energy conservation opportunities for various electrical appliances	3	PO2, PO10

Syllabus

Generating stations: Organization of power sector in India, Layout & Operation of Thermal, Hydro, Nuclear and combined cycle power stations. Renewable Energy sources- Solar PV, solar thermal, Wind Power Plant, OTEC, Biomass power plants and Fuel Cells.

Basic Concepts of passive elements of R, L, C and their VI relations, Ohms law, Sources dependent and independent, Kirchhoffs laws, Network reduction techniques series, parallel, series and parallel, Concepts of AC quantities Phase, power factor, real and active powers, power factor improving methods

Electrical Machines: Faradays laws, construction and working of DC machines, construction and working of Induction machines, construction and working of special machines stepper motors, BLDC motors. Advantages and Disadvantages, applications. Speed control techniques

Energy Conservation: General Aspects of Energy Auditing: Introduction - Types of Energy Auditing, Benefits of Energy Audit, Methodology for Energy Audit , Energy Audit Report format, Energy conservation opportunities for domestic consumers, energy conservation opportunities for lighting systems, cooling and heating systems. Concept of green and smart buildings. Government initiatives

Reference Books

1 A Course in Power Systems , J B Gupta , 1987, S. K. Kataria & sons .

2 Fundamentals of Electric Circuits , Charles K Alexander, Mathew N O Sadiku , 2000, Tata McGraw Hill Education Pvt. Ltd. .

3 Electrical Machines , P.S. Bhimbra , 1983, Khanna Publishers .

4 Energy Management Handbook , Stephan A. Roosa, Steve Doty, Wayne C. Turner , 1980, River Publishers. .

5 Electrical Technology , N. P Subramaniam, Anoop Mathew , 2002, Alpha Science International Limited, Oxford Press U.K. .

24AG1104 - GRAPHIC DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG1104	GRAPHIC DESIGN	GDS	R	2	0	4	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Remember the different Design techniques and their relative advantages of logo design, Stationery design, Marketing Collateral designs, of different applications.	2	PO1
CO2	Understand different Design techniques and their relative advantages of Products& Packaging, Apparel Design, Retail Design, of different applications	2	PO2
CO3	Apply different Design techniques and their relative advantages of Creating 3-D Packages in Illustrator and Photoshop, Editing photographs for use in for projects, of different applications.	3	PO3
CO4	Analyze different Design techniques and their relative advantages of Developing color schemes for final design Page layout and Projects of different applications.	3	PO4
CO5	Evalute Students will collate a comprehensive portfolio that reflects their proficiency in graphic design, demonstrating the application of design principles and software skills to produce high-quality visual materials across various mediums and platforms."	4	PO5

Syllabus

Graphic design (Raster graphic), Basic Selections, Adjustment Panel, Tool Bar Tools, Basic Photo Corrections, Layers, Enhancing Digital Photographs, Creating Vector Graphics in Photoshop

Getting Started, Interface Layout, Photoshop-Toolbox, Photoshop-Alteration Tools, Drawing and Selection Tools / Assisting Tools, Color Boxes and Modes, Basic Image Editing, Correcting and saving the file

Trifold Brochures for Business, Product Packaging Design, Brand and Logo Design Business Branding Essentials,actions,color restoration ,image manipulations

Design To Redesign, Remake old posters using typographic design, Movie Posters, Album Cover, Various Printed Materials, Invitation Postcards, Birthday Invitation, Wedding Invitation

Reference Books

1 The New Basics, Ellen Lupton and Jennifer Cole Phillips, 1st, Ellen Lupton and Jennifer Cole Phillips.

2 Logo Design Love, David Airey, 2nd, David Airey.

3 The Graphic Design Idea Book, by Steven Heller and Gail Anderson, 1st, by Steven Heller and Gail Anderson.

4 The Non-Designer's Design Book, by Robin Williams, 2nd, by Robin Williams.

24AG2108A - ADVERTISING AND PUBLIC RELATIONS (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG2108A	ADVERTISING AND PUBLIC RELATIONS	APR	A	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Remember basic and emerging concepts and principles in theareas of advertising & allied fields	1	PO1, PO4
CO2	Understand various types and functions of Advertising agencies	2	PO2
CO3	Apply knowledge in advertising to create ad campaigns and PRcampaigns	3	PO1, PO4
CO4	Analyse the need, format and step-by-step methods of publicrelations campaigning	4	PO1, PO3, PO5
CO5	"Evaluate the effectiveness of advertising and public relations campaigns by applying advanced analytical tools and techniques	4	PO2, PO3

Syllabus

Concept, Nature, Definitions, History/Evolution, Role, Objectives, Functions, and Significance ofAdvertising, Types of Advertising and Classification of Advertising

Functions, Types, Structure, Departments, Remuneration, Pitching, Client-Agency Relationship, AdvertisingObjectives, Segmentation, Positioning and Targeting

Campaign Planning, Creation and Production.Ethical & Regulatory Aspects of Advertising-Apex Bodies in Advertising-AAAI, ASCI and their codes

Working on the Account, Client-AgencyRelationship, The PR process: Research, Strategy, Measurement, Evaluation and Impact, The Role andImportance of Media in PR, Tools of Media Relations - Press Conferences, Press Meet/Tours, PressReleases

Critically evaluate communication strategies used in successful advertising and PR campaigns. Design and implement communication plans that effectively reach target audiences. Analyze the role of digital and traditional media in shaping public perception. Apply ethical considerations and cultural sensitivity in communication strategies. Measure and adapt the effectiveness of campaigns using data-driven approaches.

Reference Books

1 Ogilvy on Advertising, David Ogilvy, 2023, Headline Welbeck Non-Fiction.

2 Public Relations: Strategies and Tactics, Dennis L. Wilcox, Glen T. Cameron, Bryan H. Reber, 2015, Pearson.

3 Advertising Theory And Practice, Chunawalla, 2023, Himalaya Publishing House.

4 Strategic advertising management, Larry Percy, Richard Rosenbaum-Elliott, 2009, Oxford University Press.

24BB1206R - MARKETING MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB1206R	MARKETING MANAGEMENT	MM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the key terms, definitions, and concepts used in the study of Marketing Management and understand the changing Marketing Environment	2	
CO2	Apply the knowledge of Segmentation, Targeting and Positioning to strategize the marketing program regarding product and PLC	3	
CO3	Apply the knowledge of marketing program regarding Pricing, Distribution channel and Physical Distribution	3	
CO4	Analyze the need for Promotion methods, ethics in marketing and the importance of social and green marketing	4	
CO5	Analyze the need for Marketing Global and Marketing challenges in emerging markets Neuro marketing Viral marketing.	5	

Syllabus

Introduction Need Want and Demand Marketing Definition Concepts Significance and functions of Marketing Consumer Behaviour Nature Scope Significance and Determinants Organizational Buying Behaviour. Marketing Environment-Internal and External forces of Marketing Environment Marketing Research Marketing research process.

Market Segmentation Targeting and Positioning Strategies. Marketing Mix 4 Ps of Marketing Product Concept of Product Product Planning and New Product Development Product life cycle Branding Packing and labelling

Price Meaning Importance Objectives Factors affecting pricing Pricing policies Methods of pricing Distribution channel and physical distribution Distribution channels concepts and types of distribution channel Channel conflict Retailer and Wholesaler Physical Distribution of goods Transportation Warehousing.

Promotion Methods of Promotion Advertising Media their merits and limitations Personal selling and sales force management Sales Promotion and publicity. Marketing organization Marketing control Ethics in Marketing Social Marketing Green marketing Online Marketing

Analyze the need for Marketing Global and Marketing challenges in emerging markets Neuro marketing Viral marketing

Reference Books

1 Marketing Management , Phillip Kotler and Kevin keller , 15th 2016, Pearson Publication .

2 Marketing: Concepts and Cases, Etzel, walker Stanton and Pandit, 14th 2019, TMH.

3 Marketing Management Planning Implementation and Control , Rama Swamy and NamaKumari , 5th, 2020, McMillan.

4 Upstream Marketing: Unlock Growth Using the Combined Principles of Insight, Identity, and Innovation, Tim Koelzer and Kristin Kurth, 2,2019, Upstream.

24BB2107R - FOUNDATIONS OF FINANCIAL MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB2107R	FOUNDATIONS OF FINANCIAL MANAGEMENT	FM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To understand the Finance Functions and types of Business	2	
CO2	To apply the long term and short term investment decisions	3	
CO3	To apply the working capital requirements in a company	3	
CO4	To apply different Capital Structure and dividend policies in Practice	3	
CO5	To learn about corporate restructuring	3	

Syllabus

Introduction to Financial Management: Financial Management, Definitions, Investment Decision, Finance Decision, Dividend Decision, Objective of Financial Management, Shareholders Wealth Maximisation. Types of Business, Proprietary company, Partnership Company, Company, Features, Merits and Demerits, Private Limited Company Vs. Public Limited Company, Classification of companies, Franchisee, Cooperative Society

Capital Budgeting and Cost of Capital Meaning, Features, Techniques of Capital Budgeting, Traditional methods- Payback Period, ARR and Modern Methods- NPV, IRR & Profitability Index, Case studies on Capital Budgeting. Sources of Finance: Short term sources_ Cash credit limit, Overdraft, Bill Discounting, Short term loans, Long term sources: Equity, Preference, Bond/ Debenture, Term loans, Venture capital financing. Calculation of Weighted Average Cost of Capital and Specific Cost of Capital.

Working Capital Management Gross working capital, Net working Capital, operating cycle, Determinants of Working Capital, Computation of working capital Requirement, Case studies Cash Management, Receivables and Inventory Mgt.

Capital Structure and Dividend Operating Leverage, Financial Leverage, Combined Leverage, EBIT EPS Analysis, Capital structure Theories, NI, NOI, Traditional Theory, MM Hypothesis. Dividends, Meaning, Types of Dividend, Dividend Policies in Practice, Walter, Gordon and MM Hypothesis, EBIT EPS case study

Corporate restructuring : Mergers and Acquisitions

Reference Books

1 Financial Management, Pearson., Jonathan Berk, Peter Demarzo, , 17, Pearson..

2 Financial Management, Prasanna Chandra, 10, TMH.

3 Fundamentals of Financial Management, Prasanna chandra , 21, TMH.

4 Financial Management, Khan and jain, 9, kalyani publications.

24CA2108R - COMPUTER NETWORKS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA2108R	COMPUTER NETWORKS	CN	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of computer networks and data communication.	2	PO2
CO2	Understand and Analyze the fundaments of Data Communication	2	PO1
CO3	Analyze the IEEE Standards, Data Link Layer and Evaluate design issues in networks.	4	PO1
CO4	Analyze Internet Transport Protocols and Evaluate different types of protocol, Evaluate various types of Network Devices and different types of Networks.	4	PO4

Syllabus

Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications, Data Communications: Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, Broad Band ISDN, ATM Network. Data Link Control, Error Detection & Correction, Sliding Window Protocols.

LANs &MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5,802.6, High Speed LANs. Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

Internet Transport Protocols: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues. Overview of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

Network Devices: Overview of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, routers, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies. Overview of Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks, Sensor Networks.

Reference Books

1 Computer Networks, Andrews S Tanenbaum, 5th Edition,2010, Pearson.

2 Computer Networks, A System Approach, Larry L Peterson and Bruce S Davie, 5th Edition,2011, Pearson.

3 CCNA Exploration Course Booklet: Routing Protocols and Concepts, Pearson, Version 4.0, 2004.

4 Understanding Communications and Networks, W.A. Shay, Thomson, 3rd Edition,2004 , Pearson.

24CA2210 - SOFTWARE ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA2210	SOFTWARE ENGINEERING	SE	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate the requirement of software development for various applications.	2	PO1
CO2	Utilize some of the Process Models in software engineering for software development.	3	PO2, PO3
CO3	Identify stakeholders requirements, multiple viewpoints, eliciting requirements pts, Extreme Programming, SAFE Methodology	3	PO2, PO3, PSO2
CO4	Examine a wide range of testing techniques used in software development to ensure comprehensive understanding and application.	4	PO2, PO3, PSO2

Syllabus

To impart a deep understanding of software and software engineering, encompassing the nature of software, diverse application domains, and the distinctive characteristics of web applications.

To familiarize learners with various process models, including generic, prescriptive, specialized, and the unified process, and to enable them to apply reverse engineering techniques for understanding data, processing, and user interfaces effectively.

Understanding Requirements: Identify stakeholders, recognizing multiple viewpoints, eliciting requirements, Building requirement model, negotiating requirements, validating requirements, SRS Vs User Stories. Agile Modeling, Extreme Programming, Scrum, Kanban, SAFe Methodology.

To impart a solid understanding of Test Driven Development (TDD) basics and strategic software testing approaches, including test strategies for conventional software, Black-Box and White-Box testing methodologies, validation testing, and system testing techniques.

Reference Books

1 Software Engineering : A Practitioners Approach, Roger S.Pressman, 2014, Mc Graw Hill.

2 Software Engineering, Ian Sommerville, 2015, Pearson Education.

3 Agile and Iterative Development: A Managers Guide, Craig Larman, 2015, Addison-Wesley.

4 Applying UML and Patterns: An introduction to OOAD and design and interface deployment, Craig Larman, 2005, Pearson Education.

5 Software Engineering, Stephen R.Schach, 2012, Tata Mc Graw Hill.

24OEAR01 - ARCHITECTURAL JOURNALISM (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OEAR01	ARCHITECTURAL JOURNALISM	AJ	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the terminologies related to Journalism, to understand architectural photography and articles, understanding differences between Journal, magazine, article, blog etc.	2	PO4
CO2	Understand ethics in journalism, law legal boundaries, public relations and impacts	2	PO5, PSO2
CO3	Apply the writing skills, blogs, and books, reviewing an article and familiarizing oneself with pioneer architectural Journalists at Local, National, and international platforms.	3	PO8
CO4	Understand techniques of photojournalism, photojournalism in perspectives, and contemporary architectural journalism, and develop an article based on research	2	PO7

Syllabus

Definition of Photojournalism Brief History Photographs as social Documentaries Birth of modern Photojournalism since the 1950s visual awareness visual survey EDFAT methods in using the camera Equipment required for Photojournalism.

Usage of language and Vocabulary and grammar introduction to the methodology of writing essays, news writing, precis writing, writing in architectural blogs listening comprehension, analysing talks, and information gathered and editing gathered information to build an article. The originality of the topic. Collecting clippings from articles, blogs, and books.

PRODUCTION AND PRESENTATION LEGAL BOUNDARIES: Key texts concerning architectural journalism and journalists; to critically contrast their outputs in terms of production, content, and/or presentation; to develop an ability to critically appraise selected individual pieces of journalism. Awards for Architectural Journalism and some of the important recipients. People journalism and law legal boundaries-issues libel and invasions of privacy ethics- the photojournalist on scene

PRODUCTION OF CONTEMPORARY ARCHITECTURAL JOURNALISM Building pictures Instant, Report Editing Editorial thinking the picture Editor Editing practices, creating drama Photo editing Documentary evolution of the word document methods and techniques RESEARCH AND PRESENTATION: Assignments should include an article based on the ability to originate, plan, research, present, and produce a piece of architectural journalism. The techniques and processes used in the production should be identified by the student.

Reference Books

1. How to photograph buildings and interiors, 3rd ed.New York , Kopelow, Gerry. , 2002, Princeton Architectural Press .
2. Architectural photography, De Mare, Eric Samuel, 1975, London: Bats ford .
3. The photography of architecture: twelve views, Busch, Akiko, 1987, New York: Van Nostrand Reinhold Co. .
4. Happenings: journal of luminous moments , Mehta, Ashvin, 2003, Vapi, Gujarat: Hindustan Inks .
5. Architectural Criticism and Journalism , Mohd, Al Asad., 2007, Turin: Umberto Allemandi & Geneva: The Aga Khan Trust for Culture.
6. Tom Wolfe on Modern Architecture , Sommer, Robert. , 2000, Bell & Howell Information and Learning Company Copyright, Popular Press. .

24OEBB01 - ESSENTIALS OF FINANCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OEBB01	ESSENTIALS OF FINANCE	EOF	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basics of financial accounting, including the preparation and interpretation of financial statements.	2	PO1
CO2	Apply time value of money concepts to analyze engineering project cash flows and make investment decisions	3	PO7
CO3	Evaluate various investment appraisal techniques such as Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period for engineering projects	3	PO8
CO4	Develop skills in financial planning, budgeting, and forecasting for engineering projects or startups.	3	PO9

Syllabus

Introduction to Financial Accounting Overview of financial accounting Preparation of Profit and Loss account and Balance Sheet,

Future value and present value concepts Compounding and discounting Applications in engineering project valuation

Investment Appraisal Techniques Net Present Value (NPV) Internal Rate of Return (IRR) Payback Period Profitability Index

Financial Planning and Budgeting Financial planning process Budgeting techniques Cash flow forecasting

Reference Books

1 Finance for Engineers: Evaluation and Funding of Capital Projects, Frank Fernandez, second, Wiley.

2 Engineering Economics and Finance for Transportation Infrastructure, Hojjat Adeli, First, Springer.

3 Financial Management for Engineers, Lawrence P. Grayson, Fourth, Pearson.

4 Project Management for Engineering, Business and Technology, John M. Nicholas, Herman Steyn, Fifth, Elsevier.

24OEBB02 - ESSENTIALS OF MARKETING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OEBB02	ESSENTIALS OF MARKETING	EOM	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand how analytical techniques and computer models can enhance decision making by converting data and information into insights and decisions	2	PO1, PSO2
CO2	Understand to view marketing phenomena and processes in ways that are amenable to decision modeling.	2	PO3, PSO2
CO3	Understand to expose students to a number of examples of the successful use of marketing engineering	2	PO4, PSO2
CO4	Understand to provide you with a software toolkit that will enable you to apply marketing engineering to real marketing decision problems.	2	PO6, PSO2

Syllabus

Introduction and Nature of Marketing: Evolution of Marketing Concept - Core concepts of marketing - Scope and Importance of Marketing. -Difference between Selling and Marketing - Marketing Myopia - Consumer Marketing Vs. Industrial Marketing.

Understanding Consumer Behavior Nature scope and importance of consumer behavior Factors influencing Consumer Behavior Buying decision making process Market Segmentation Targeting and Positioning

Marketing mix Product definition levels of product product classification difference between goods and services Product Life Cycle New Product Development Technology and Product Management Concept of Pricing Factors influencing the pricing policy Pricing strategies Pricing Considerations in HighTech Markets

Promotion mix Marketing Communication Tools for HighTech Markets Channels of distribution Supply Chain Management in HighTech Markets Technology Marketing Green Marketing

Reference Books

1 Principles of Marketing, Philip Kotler and Gary Armstrong, 15 ,2003, Pearson Education.

2 Marketing of HighTechnology Products and Innovations, Jakki J Mohr, 3e 2018, Pearson Education.

3 Marketing Management and Systems, V.S. Ramaswamy , 4e, 2011, Mc Millan Publications.

4 Marketing Management and Information Systems, S Namakumari, 4e , 2021, Mc Millan Publications.

24OEBB03 - ESSENTIALS OF HUMAN RESOURCES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OEBB03	ESSENTIALS OF HUMAN RESOURCES	EOHR	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basics of HRM and integrated perspective on role of HRM in modern business.	2	PO3
CO2	Understand the planning of human resources and gain competency to recruit employees.	2	PO5
CO3	Apply the skills on training and appraising the performance of employees.	3	PO5
CO4	Apply the knowledge on compensation and salary administration and handling employee issues.	3	PO6, PSO2

Syllabus

Introduction: Meaning and Definition, Importance of HRM, Functions of HRM, Nature & Scope of HRM, Objectives of HRM, Challenges of Human Resource Management; Personnel management vs Human Resource Management.

Manpower planning: objectives, importance, process; Job Analysis: Job Description, Job specification, uses of job analysis; Job design: Techniques of Job design; Employee Recruitment: sources of recruitment, methods of recruitment; Selection: process of selection, Types of interviews, Interview Tests; Placement and Induction, Transfer, Promotion and Separation

Training and Development: Training vs Development, methods of training: on-the job and off- the job methods; Performance Appraisal: process of performance appraisal, methods of appraisal, Errors in appraisal, Job evaluation: Methods of job evaluation; Employee Compensation: Objectives of compensation, Components of compensation; Employee Benefits, Employee Welfare and Safety.

Employee Grievances, Employee Discipline, Industrial Relations, Trade Unionism, Collective Bargaining, Managing Ethical issues in HRM, HR audit and Evaluation, International HRM, eHRM, HRIS, Recent trends in HRM: Managing Diversity, Downsizing, Contingent workforce, Tele commuting, Competency Mapping, Talent

Reference Books

1 Human Resource Management, Gary Dessler, 2007, Pearson Education.

2 Human Resource Management, Raymond Andrew Noe, John R. Hollenbeck, Barry Gerhart, Patrick M Wright, 2021, The McGraw Hill Pub.

3 Managing Human Resources, Louis &Gomitz Mejia, 2010, Pearson Education.

4 Human resource management Text and cases, Aswathappa K, 2018, Tata McGraw Hill Pub.

24OECA01 - FUNDAMENTALS OF DATA ANALYTICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OECA01	FUNDAMENTALS OF DATA ANALYTICS	FDA	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate basic statements and control structures manipulations with R studio environment with installation and package loading Procedures.	2	PO1, PO2, PO3, PSO2
CO2	Summarize the basic operations of creation, add elements, access elements and other basic operations with Vector, List, Matrix, array Data structures in R.	2	PO1, PO5, PSO2
CO3	Make use of analytic operations with Data Frame creation, access elements, manipulate and explore data frame with necessary data preprocessing and data exploration operations.	3	PO1, PO2, PSO2
CO4	Apply Visualization methods using various graph techniques including title, legend and color manipulaion for knowledge pattern and interpreting the pattern in a useful manner..	3	PO1, PO5, PSO2

Syllabus

Introduction to Data Analytics: Differences between Data Analysis and Data Analytics. Data basics: Quantitative and Qualitative data types and categories. Programming using RStudio. Rstidio fundamentals with package Installation. Programming fundamentals in R: Data types, Operators, Control structures and R functions.

Basic Data structures in R R Vectors , Vector creation using different methods, Access the vector elements, and perform operations with vector elements. R List Creating a List, Add,Delete Element to or from a List, Size of List, Merging Lists, Matrix creation, Access elements and Arithmetic operations. R Arrays Accessing Array Elements, Calculation Across Array Elements , R Factors creating factors.

Data Frames Create Data Frame, Data Frame Access. Working with data frame. Expand Data frame and Merge data frame. Pipe, Filter and subset operations. Data cleaning, Data transformation, Separate and Mutate. Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median , Mode , Summation, Variance, Standard Deviation, Analyzing a sample, The Normal Distribution, Skewness, Correlation.

Visualizations in R Visualization basics in R and tidyverse. Getting started with ggplot(). More operations on ggplot() for more graph types. Aesthetics and facets. Saving your visualizations. Working with .CSV and Excel file.

Reference Books

1 R Programming for Beginners, Sandip Rakshit, 2017, Mcgraw hill Education.

2 Data Analytics using R, Seema Acharya, 2018, McGraw hill.

3 R for Dummies, Andrie de Vries, JorisMeys, 2015, John Wiley and Sons.

4 R for Data Science, Garrett Grolemund , Hadley Wickham , 1, 2017, O'Reilly Media.

24OECA02 - ESSENTIALS OF SOFTWARE DEVELOPMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OECA02	ESSENTIALS OF SOFTWARE DEVELOPMENT	ESD	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the software, documentation, programming, testing, and ongoing maintenance of a software deliverable	2	PO1, PO5
CO2	Analyze the steps in the software development life cycle and their stages, process and applications in their developments	4	PO3
CO3	Analyze the practices throughout the software development life cycle, feedback analysis and other process	4	PO5
CO4	Analyze key features of effective software development using Agile DevOps	4	PO3

Syllabus

Software development refers to the design, documentation, programming, testing, and ongoing maintenance of a software deliverable. The combination of these steps are used to create a workflow pipeline, a sequence of steps that when followed produce high-quality software deliverables

The pipeline is known as the software development life cycle. Discover, Plan, Build and Test, Deploy, Operate and Observe

Practices throughout the software development life cycle; Continuous Feedback and Security

Key features of effective software development Agile DevOps Continuous integration and delivery (CI/CD) Microservices

Reference Books

1 THE ESSENTIALS OF SOFTWARE ENGINEERING (The Art of Software Development), Dr. Saranya S, 10 January 2024, Notion Press.

2 Patterns of Enterprise Application Architecture, Martin Fowler, 2000, Addison-Wesley Signature Series.

3 Programming Pearls, Jon Bentley, 2009, ACM Press.

4 Essentials of Software Engineering, Frank Tsui, 2016, Paperback.

24OEVC01M - GRAPHIC DESIGN (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OEVC01M	GRAPHIC DESIGN	GDN	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Remember the different Design techniques and their relative advantages of logo design, Stationery design, Marketing Collateral designs, of different applications	2	PO1
CO2	Understanding different Design techniques and their relative advantages of Products& Packaging, Apparel Design, Retail Design, of different applications.	2	PO2
CO3	Applying different Design techniques and their relative advantages of Creating 3-D Packages in Illustrator and Photoshop, Editing photographs for use in for projects, of different applications.	3	PO3
CO4	Analyzing different Design techniques and their relative advantages of Developing color schemes for final design Page layout and Projects of different applications.	4	PO4

Syllabus

Graphic design (Raster graphic), Basic Selections, Adjustment Panel, Tool Bar Tools, Basic Photo Corrections, Layers, Enhancing Digital Photographs, Creating Vector Graphics in Photoshop

Getting Started, Interface Layout, Photoshop-Toolbox, Photoshop-Alteration Tools, Drawing and Selection Tools / Assisting Tools, Color Boxes and Modes, Basic Image Editing, Correcting and saving the file

Trifold Brochures for Business, Product Packaging Design, Brand and Logo Design Business Branding Essentials,actions,color restoration ,image manipulations

Design To Redesign, Remake old posters using typographic design, Movie Posters, Album Cover, Various Printed Materials, Invitation Postcards, Birthday Invitation, Wedding Invitation

Reference Books

1 Grid Systems: Principles of Organizing Type, Kimberly Elam, 2nd, by Kimberly Elam.

2 Color Design Workbook, Terry Lee Stone, 1st, Terry Lee Stone.

3 "Graphic Design: The New Basics", Ellen Lupton and Jennifer Cole Phillips, 1st, by Ellen Lupton and Jennifer Cole Phillips.

4 "Thinking with Type" , Ellen Lupton, 1st, by Ellen Lupton.

24OEVC02 - PHOTOGRAPHY BASICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24OEVC02	PHOTOGRAPHY BASICS	PGB	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Students will demonstrate proficiency in using various camera settings and functions, including aperture, shutter speed, ISO, and white balance, to capture high-quality photographs in different lighting conditions.	1	PO1
CO2	Students will apply principles of composition, such as the rule of thirds, leading lines, framing, and balance, to create visually appealing and impactful photographs.	2	PO2
CO3	Students will acquire skills in photo editing software, such as Adobe Photoshop and Lightroom, to enhance and manipulate images, improving their overall quality and artistic expression.	2	PO3
CO4	Students will explore and practice various genres of photography, including portrait, landscape, macro, street, and event photography, understanding the unique techniques and challenges associated with each.	3	PO4

Syllabus

o Overview of the course and objectives o History and evolution of photography o Introduction to different types of cameras and lenses o Basic camera operations and settings (aperture, shutter speed, ISO) o Understanding image resolution and file formats

o Detailed exploration of aperture, shutter speed, and ISO o White balance and its impact on photos o Using different shooting modes (manual, aperture priority, shutter priority) o Exposure triangle and achieving correct exposure o Practical exercises to apply camera settings

Composition and Framing: o Principles of composition (rule of thirds, leading lines, framing) o Understanding and using negative space o Techniques for creating balance and symmetry o Using perspective and depth in photography o Assignments on composing effective photographs

Lighting Techniques: o Basics of natural and artificial lighting o Understanding and using different types of light (hard vs. soft light) o Techniques for indoor and outdoor lighting o Introduction to studio lighting setups o Practical sessions on manipulating light for desired effects

Reference Books

1 Understanding Exposure, Bryan Peterson, 2016, Amphoto Books.

2 The Digital Photography Book, Scott Kelby, 2008, Peachpit Press.

3 The Photographer's Eye: Composition and Design for Better Digital Photos, Michael Freeman, 2007, Focal Press.

4 Light, Science & Magic: An Introduction to Photographic Lighting, Fil Hunter, Steven Biver, Paul Fuqua, 2015, Routledge.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Value Added Courses (VAC)

23CC3127 - CAMBRIDGE LINGUASKILL CERTIFICATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CC3127	CAMBRIDGE LINGUASKILL CERTIFICATION	CLSC	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction to Linguaskills - Reading Strategies, Reading Practice and Reading Comprehension	2	PO6
CO2	Listening Strategies, Listening Ptractice and Listening Comprehension	2	PO6
CO3	Speaking Strategies, Vocabulary, Stress and Intonation, Speaking Practice and Speaking Exercises	2	PO6
CO4	Writing Strategies, Common Errors, Grammatically proper sentences, Writing Practice and Writing Exercises	2	PO6

Syllabus

Reading: Read & Select, Gapped Sentences, Multiple Choice Gap Fill, Open Gap Fill, Extended Reading.

Listening: Listen and Select, Extended Listening

Speaking: Interview, Reading Aloud, Long Turn 1, Long Turn 2, Communication Activity

Writing: E-Mail and Long Text (E-Mail, Journal, Blog, Article)

Reference Books

1 Empower B2 Upper Intermediate Workbook, Cambridge University Press, Latest, Cambridge University Press.

2 First Certificate Language, Michael Vince, Latest, Cambridge University Press.

24CC4005 - SQL FOR DATA ANALYTICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CC4005	SQL FOR DATA ANALYTICS	SQL	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of SQL syntax and database conceptS	2	, PSO2
CO2	Perform data retrieval and manipulation tasks using SQL.	2	, PSO2
CO3	Utilize SQL for querying, filtering, sorting, and aggregating data.	4	, PSO2
CO4	Apply SQL to join multiple tables and perform advanced data analysis	4	, PSO2
CO5	Create basic reports using SQL queries.	4	, PSO2

Syllabus

Understand the fundamentals of SQL syntax and database conceptS

Perform data retrieval and manipulation tasks using SQL.

Utilize SQL for querying, filtering, sorting, and aggregating data.

Apply SQL to join multiple tables and perform advanced data analysis

Create basic reports using SQL queries.

Reference Books

1 SQL for Mere Mortals: A Hands-On Guide to Data Manipulation in SQL, Michael J. Hernandez and John L. Viescas, 2,2020, tMH.

2 SQL in 10 Minutes, Sams Teach Yourself, Ben Forta , 2,2022, cENAGE .

3 SQL Cookbook for Data Scientists: 80 Techniques to Improve Your Data Analysis, Yu-Wei, Chiu (David), 3,2021, tmh.

4 SQL Practice Problems: 57 beginning, intermediate, and advanced challenges for you to solve using a , ylvia Moestl Vasilik, 2, 2021, tmh .

24CC4006 - PROGRAMMING USING PYTHON (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CC4006	PROGRAMMING USING PYTHON	P P	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction to Python	2	, PSO2
CO2	Data Structures	3	, PSO2
CO3	Functions and Modules	3	, PSO2
CO4	File Handling and Exceptions	3	, PSO2
CO5	Object-Oriented Programming (OOP) Basics	3	, PSO2

Syllabus

Overview of Python and its features Installing Python and setting up the environment Basic syntax and data types Control flow: if statements, loops Input/output operations

Lists, tuples, dictionaries, sets Working with sequences and collections List comprehensions Strings and string manipulation

Defining and calling functions Parameters and arguments Return values Scope and namespaces Introduction to modules and packages

Opening, reading, writing, and closing files Working with different file formats Exception handling: try-except blocks, handling specific exceptions Using the with statement for file operations

Reference Books

1 Python Crash Course, Eric Matthes, 4, No Starch Press.

2 Automate the Boring Stuff with Python, Al Sweigart, 5, No Starch Press.

3 Fluent Python , Luciano Ramalho, 4, O'Reilly Media.

4 Learning Python, Mark Lutz, 4, O'Reilly Media.

5 Data Science from Scratch, Joel Grus, 4, O'Reilly Media.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Audit Courses (AUC)

23UC0009 - ECOLOGY AND ENVIRONMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23UC0009	ECOLOGY AND ENVIRONMENT	E&E	R	2	0	0	0	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Discuss natural resources and importance of environmental science.	2	PO7
CO2	Describe various ecosystems and applications of biodiversity.	2	PO7
CO3	Identify and discuss causes, prevntie measures of environmental polution.	2	PO7
CO4	Summarize constitional acts for environmental science, knowledge on solid waste management and disaster management.	2	PO7

Syllabus

The Multidisciplinary nature of Environmental Studies Introduction to Environment Definition scope importance Multidisciplinary nature of Environmental Studies, Need for public awareness. Institutions and people in Environment. Natural Resources Renewable and Non Renewable Resources Forest resources Uses Deforestation causes, effects, and impacts, Afforestation Programmes-Socio-forestry, Agro forestry, Vanasamrakshana programs. Mining its impact on the environment mining, dams and their effects on forests and tribal people. Water resources: Distribution of surface and groundwater, Aquifers, floods drought conflicts over water, dams benefits and problems, Water conservation rain water harvesting watershed management, Cloud seeding Mineral resources: Use exploitation environmental effects. Food resources Changes in agricultural methodologies, comparison between old and new methods of farming, Green Revolution, Environmental Impact Assessment of conversion of agricultural lands effects of modern agriculture, Drip Irrigation fertilizer-pesticide problems, Eutrophication, Vermicompost water logging, blue baby syndrome Energy resources Growing energy needs renewable and non-renewable energy sources Solar, wind, geothermal, tidal, bioenergies. Land resources Land as a resource land degradation Soil erosion: Importance of soil, Types of soil erosion, Causes and effects of soil erosion. How to control soil erosion. Role of an individual in conservation of natural resources.

Ecosystems Concept of an ecosystem Structure and function of an ecosystem Producers consumers decomposers with examples, Energy flow in the ecosystem Ecological succession Food chains food webs and ecological pyramids. Types of ecosystems characteristic features, structure, and function of the following ecosystem a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem e. Aquatic ecosystems ponds, streams, lakes, rivers, oceans, estuaries. Biodiversity and its Conservation: Introduction Definition: genetic, species and ecosystem diversity. Biogeographical classification of India Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values Biodiversity at global, National, and local levels India as a mega-diversity nation Hotspots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution Definition Causes, effects, and control measures of a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution. e. Noise pollution f. Thermal pollution g. nuclear hazards Solid waste Management Causes, effects, and control measures of urban and industrial wastes. Role of an individual in the prevention of pollution. Pollution case studies. Disaster management floods, earthquakes, cyclones, and landslides. Social Issues and the Environment from Unsustainable to Sustainable development Urban problems related to energy Water conservation. rainwater harvesting, watershed management.

Resettlement, and rehabilitation of people its problems and concerns. Case studies Environmental ethics issues and possible solutions. Climate change global warm acid rain, ozone layer depiction. nuclear accidents and holocaust. Case studies. Wasteland reclamation. Environmental Protection Act, Air (Prevention and Control of Pollution) Act Water (Prevention and control of Pollution) Act Wildlife Protection Act Forest Conservation Act Issues involved in the enforcement of environmental legislation. Public awareness Human Population and the Environment Population growth, Population explosion Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV AIDS Case Studies.

Reference Books

1 Text Book of Environmental Studies, Erach Bharucha, 2010 , 4, United Grants Commission, Universities Press (India) Pvt Ltd., Hyderabad .

2 Environmental Studies, Benny Joseph, 2009, 5, The McGraw-Hill Companies, New Delhi.

3 Textbook of Environmental Studies, Deeksha Deve and S.S. Kateswa , 2009, 3, Cengage Learning India Pvt ltd, New Delhi .

4 Environmental Studies, Anubha Kaushik, C.P. Kaushik , 2007, 4, New Age International.

5 Environmental Biology, P.D. Sharma, 2009, 7, Rastogi Publications, Meerut.

24AUBA02 - SOCIAL SCIENCE RESEARCH (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AUBA02	SOCIAL SCIENCE RESEARCH	SSR	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand and comprehend the basics in research methodology and applying them in research/ project work.	2	PO1, PO4, PO10, PSO3
CO2	Understand data collection, sampling design, hypothesis settings in the Social Science research.	2	PO1, PO4, PO10, PSO3
CO3	Apply the development skills of qualitative and quantitative data analysis and presentation.	3	PO1, PO4, PO10, PSO3
CO4	Analyse issues and Challenges on the Social Science Research.	4	PO1, PO4, PO10, PSO3

Syllabus

Social Science Research: meaning and significance, Objectivity in Social Science Research, Types of Research: Historical and Analytical, Quantitative and Qualitative, Empirical and Normative, Research Design: Experimental and exploratory research designs, Preparing research proposals: Selection of the topic, Review of literature, Identifying Objectives of the Study, preparing Research Questions, Hypothesis formation.

Data Collection: Sources of Data: Primary and Secondary, Methods of collecting data: Observation, Questionnaire, Interview, Focus groups and Case study method, Sampling and Types of Sampling: Random sampling, Systematic sampling and Stratified sampling, and Survey Research: Role of library and Internet.

Data Analysis: Measures of Central Tendencies, Measures of Dispersion, Regression Analysis, and Correlation Analysis,Data Analysis: Validation of Data, Writing research report, Format of the report, and Style of referencing, and Bibliography.

Issues in Social Science Research: Ethical Considerations, Bias and Objectivity, Replication and Reproducibility, Methodological Limitations, and Generalizability and External Validity, Issues in Social Science Research: Cultural Sensitivity, Interdisciplinary Integration, Funding and Resources, Publication Bias, Technological Advances, and Plagiarism.

Reference Books

1 Social Research Methods, Alan Bryman, 1st Edition, 2018, OUP: London .

2 Research Methods in Social Sciences, B A Prasad Sharma and P. Satyanarayan. , 2nd Edition, 1983 , New Delhi: Sterling Publications .

3 Research Methods in the Social Sciences, Bridget Somek and Cathy Lewin , 1st Edition, 2005, Sage Publications.

4 Scientific Method and Social Research, B.N Ghosh , 1st Edition, 1984 , New Delhi: Sterling Publications.

CADCOML1V1 - CAREER ADVANCEMENT:COMPETITIVE EXAM TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CADCOML1V1	CAREER ADVANCEMENT:COMPETITIVE EXAM TRAINING	CAD: COM	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Enhance critical thinking and problem-solving skills to analyze and solve complex problems effectively.	3	PO9
CO2	Apply strategic test-taking techniques to improve performance and manage exam-related stress.	3	PO9

Syllabus

Introduction to Critical Thinking: covering the definition, importance, and key components; Logical Reasoning: focusing on types of reasoning (deductive and inductive) and common logical fallacies; Data Interpretation: analyzing graphs, charts, and statistical information; and Problem-Solving Techniques: emphasizing creative problem-solving methods and structured frameworks.

Practice Sessions through case studies and group discussions. It also explores Understanding Exam Formats, providing an overview of common competitive exams such as GRE, GMAT, and UPSC, along with types of questions encountered. Students will learn Time Management Techniques for prioritizing questions and allocating time efficiently, alongside Effective Study Habits to create study schedules and utilize resources. The syllabus includes Stress Management Strategies, focusing on mindfulness and relaxation techniques, and concludes with Mock Exams and Feedback to assess performance and identify areas for improvement.

Reference Books

1 Critical Thinking: A Beginner's Guide, Gail McDonald, Springer, 2018.

2 The 7 Habits of Highly Effective People, Stephen R. Covey, Free Press, 2020.

CADCORL1V1 - CAREER ADVANCEMENT: TRAINING IN CORE DOMAIN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CADCORL1V1	CAREER ADVANCEMENT: TRAINING IN CORE DOMAIN	CAD: TICD	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply advanced domain-specific concepts and emerging trends to address industry challenges and innovations.	3	PO1, PO2
CO2	Apply advanced problem-solving and strategic decision-making techniques to manage complex projects within the core domain.	3	PO1, PO2

Syllabus

Core Concepts, theories, and frameworks of the specific domain (e.g., finance, IT, healthcare, engineering), Advanced Domain-Specific Tools, innovations and their impact on the core domain, Real-world examples of how new trends are being applied within the domain

Domain specific challenges, Practical exercises to resolve complex issues in the domain, best practices for managing projects within the domain, Case Studies and Simulations.

CADENTL1V1 - CAREER ADVANCEMENT:ENTREPRENEURIAL CAREER PATHWAY TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CADENTL1V1	CAREER ADVANCEMENT:ENTREPRENEURIAL CAREER PATHWAY TRAINING	CAD: ECPT	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	apply essential entrepreneurial qualities such as resilience, innovation, and risk-taking, enabling them to pursue entrepreneurial career paths in various contexts, including startups, corporate roles, and freelancing.	3	PO8
CO2	Develop the skills to recognize potential business opportunities, conduct thorough market research, and validate ideas by addressing customer needs and evaluating feasibility, preparing them to create sustainable business solutions.	3	PO8

Syllabus

Defining entrepreneurship: What it means to be an entrepreneur; The distinction between entrepreneurial and traditional career paths; The entrepreneurial mindset: resilience, risk-taking, innovation, and adaptability; Exploring entrepreneurial career pathways in startups, corporate environments, freelancing, and social ventures.

Spotting opportunities: How to find unmet needs and gaps in the market; Market research: Tools and techniques for understanding trends and customer needs; Idea validation: Testing the feasibility of your business idea; Problem-solving for innovation: Leveraging customer pain points and inefficiencies.

Reference Books

1 The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, 1st (2011), Crown Business.

2 The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company, Steve Blank, Bob Dorf, 2nd (2020), K&S Ranch Press.

3 Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Alexander Osterwalder, Yves Pigneur, 1st (2010), Wiley.

4 The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail, Clayton M. Christensen, 1st (1997), Harvard Business Review.

CADUPSL1V1 - CAREER ADVANCEMENT: UPSC-CIVIL SERVICES EXAM TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CADUPSL1V1	CAREER ADVANCEMENT: UPSC-CIVIL SERVICES EXAM TRAINING	CAD: UPSC	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the basics of Indian History and it\'s evolution	2	PO8, PO9
CO2	Understanding the basics of Indian Geography	2	PO8, PO9
CO3	Understanding the Evolution of Indian Constitution.	2	PO8, PO9
CO4	Understanding the evolution of Indian Economy	2	PO8, PO9

Syllabus

Ancient Indian History- IVC,Rig Vedic, Later Vedic, Buddhism, Jainism, Mahajanapadas, Mouryan Empire, Guptan Empire, Harshavardhana empire, Sangam Age.

Exploring The Physical and Social Geography of India: The Universe, Big Bang Theory, Solar system, Geological Time Scale, Earth\'s Interior, Earth\'s Magnetic Feild.

Indian Polity and Constitution: Sailent featuresof Indian constitution, Preamble, Fundamental RIghts, Directrive Principles of State Policy, Fundamental Duties , Indian Parliament.

Understanding India\'s Economy - Indian Economic Development, National Income, Public Finance, Indian Budget.

Reference Books

1 Indian Polity, M. Laxmikanth, 7, Tata Mc Graw Hill.

2 Indian Economy, Nitin Singhania, 5, Mc Graw Hill.

3 Ancient and Medieval India, Poonam Dalal Dahiya, 3, Mc Graw Hill.

4 Fundamentals of Physical Geography, Husain Majid, 5, Mc Graw Hill.

CADUPSL2V2 - CAREER ADVANCEMENT: UPSC-CIVIL SERVICES EXAM TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CADUPSL2V2	CAREER ADVANCEMENT: UPSC-CIVIL SERVICES EXAM TRAINING	CAD: UPSC	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand and Evaluate the significant political, cultural, and social changes and it\'s influence in contemporary society	2	
CO2	Understand and assess the interactions between human activities and economic systems in shaping geographic landscapes.	2	
CO3	Understand and analyze the structure and functioning of India\'s parliamentary and federal systems, including the intricacies of centre-state relations.	2	
CO4	Understand and able to critically evaluate the key components of the Indian economy.	2	

Syllabus

Medieval Indian History: Vijayanagaras, Kakatiyas, Delhi Sultanate, Mughal Empire and Later Mughals.

Human and Economic Geography: Population, Migration, Trade, Human settlements, Resources, Minerals and Industrial Development.

Indian Polity: Parliamentary system, Federal system, Centre-state relations, Emergency Provisions.

Indian Economy: Money and Banking, Inclusive Growth & Development, Agriculture ,Subcidies, PDS, Food Security Industries,

Reference Books

1 Medieval Indian History, Satish Chandra, 5, Mc Graw Hill.

2 Indian Constitution, D D Basu, 27, Lexicon.

3 Indian Economy, Ramesh Singh, 15, Mc Graw Hill.

4 Physical, Human and Economic Geography, D R Khuller, 2, GKP/ Access Publications.

CRTCODL1V1 - CAMPUS RECRUITMENT: LOGIC BUILDING SKILLS TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CRTCODL1V1	CAMPUS RECRUITMENT: LOGIC BUILDING SKILLS TRAINING	CRT: LBST	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply logical principles and critical thinking skills to analyze and evaluate arguments, solve problems, and make informed decisions.	3	PO1
CO2	Identify various logical reasoning techniques to solve complex problems, identify patterns, and draw valid conclusions	3	PO1

Syllabus

Introduction to Logic and Critical Thinking: fundamentals of logic, including the concepts of statements, propositions, truth values, logical connectives (AND, OR, NOT, IF-THEN, IF-AND-ONLY-IF), truth tables, and logical equivalence. Students will learn to identify and analyze different types of arguments, including deductive and inductive reasoning. They will also develop critical thinking skills, such as evaluating evidence, identifying assumptions, and recognizing fallacies

Logical Reasoning and Problem-Solving: applying logical reasoning techniques to solve various types of problems. Students will learn about different problem-solving strategies, including problem decomposition, pattern recognition, working backward, and using analogies. They will practice solving logic puzzles, brain teasers, and real-world problems that require logical thinking. Additionally, students will explore the concepts of syllogisms, Venn diagrams, and conditional reasoning to enhance their problem-solving abilities

Reference Books

1 Introduction to Logic, Irving M. Copi, Carl Cohen, Victor Rodych, 2014, Routledge.

2 Critical Thinking, Richard Paul, Linda Elder, 2019, Pearson.

3 The Art of Logical Thinking; Or, The Laws of Reasoning, William Walker Atkinson, 2013, Public domain in the

4 Symbolic logic and The game of logic, Carroll, Lewis, 1958, Dover Publications.

CRTCSSL1V1 - CAMPUS RECRUITMENT: COMMUNICATION SKILLS TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CRTCSSL1V1	CAMPUS RECRUITMENT: COMMUNICATION SKILLS TRAINING	CRT: CST	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	apply knowledge of communication of different types and techniques while analyzing body language and tone to enhance overall communication effectiveness.	3	PO8
CO2	apply active listening and feedback techniques, and analyzing effective participation in group discussions, while exploring roles in teamwork and strategies for managing conflicts, alongside professional communication practices such as writing emails and conducting meetings.	3	PO8

Syllabus

Communication: Basics, significance, types, verbal & non-verbal communication techniques, effective speaking and presentation skills tone and pacing in verbal interactions

Interpersonal skills, listening skills, feedback techniques, group communication and dynamics, group discussion, conflict management in professional communication, E-mail writing, report writing, presentations, interview skills.

Reference Books

1. Business Communication: A Problem-Solving Approach, Louis E. Boone & David L. Kurtz, 3rd Edition, McGraw Hill Education.
2. The Complete Guide to Business School Presentations", Jennifer D. D. McDonald, 2nd Edition, Pearson.
3. Listening: The Forgotten Skill", Geoffrey M. Cohen, 1st Edition, University Press of America.
4. Business Communication: Process and Product", Mary Ellen Guffey & Dana Loewy, 8th Edition, Cengage Learning.
5. Effective Communication Skills" Author, John Adair, 2nd Edition, Pan Macmillan.

CRTCSSL2V2 - CAMPUS RECRUITMENT: SOFT SKILLS TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CRTCSSL2V2	CAMPUS RECRUITMENT: SOFT SKILLS TRAINING	CRT: SST	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	applyi and practice empathy, critical thinking, problem-solving, decision-making, effective communication, and interpersonal skills through real-life scenarios and interactive activities.	3	PO8
CO2	apply group discussion techniques, interview skills, and mock interviews through practical exercises, encouraging learners to practice and refine these skills in realistic settings.	3	PO8

Syllabus

Critical thinking, problem soving, decision making, communication skills, interpersonal skills

Grooming, group discussions, story narrations, interview skills, mock interviews

Reference Books

1 Personality Development and Soft Skills", Barun K. Mitra, 2nd Edition, Oxford University Press.

2 Communication Skills for Engineers", C. Muralikrishna & Sunita Mishra, 1st Edition, Pearson Education.

3 Developing Soft Skills", Robert L. Katz, 1st Edition, McGraw Hill Education.

CRTVQRL1V1 - CAMPUS RECRUITMENT: VERBAL APTITUDE TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CRTVQRL1V1	CAMPUS RECRUITMENT: VERBAL APTITUDE TRAINING	CRT: VAT	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	apply and practice grammatical concepts like sentence formation, identifying odd words, using one-word substitutions, while enhancing understanding of idioms, phrases, spellings, and structures.	3	PO8
CO2	apply concepts like paragraph formation, sentence completion, reading comprehension, sentence correction, and correcting jumbled sentences, while enhancing word selection and sentence structure accuracy.	3	PO8

Syllabus

Synonyms, Antonyms, odd words, parts of speech, idioms and phrases, one word substitutions, odd words, formation of sentences

sentence completion, sentence correction, jumbled sentences, paragraph formation, reading comprehension, and sentence selection

Reference Books

1 The Pearson Guide to Verbal Ability and Logical Reasoning for the CAT", Nishit K. Sinha, 2nd Edition, Pearson.

2 Objective General English", S.P. Bakshi, 3rd Edition, Arihant Publications.

3 English Grammar in Use", Raymond Murphy, 5th Edition, Cambridge University Press.

CRTVQRL2V2 - CAMPUS RECRUITMENT: QUANTITATIVE APTITUDE TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CRTVQRL2V2	CAMPUS RECRUITMENT: QUANTITATIVE APTITUDE TRAINING	CRT: QAT	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply principles of quantitative techniques to solve problems on Simple Equations, Simple & Compound Interest etc	3	PO8
CO2	Apply principles of quantitative techniques to solve problems on Divisibility, Functions, Surds & Indices etc	3	PO8

Syllabus

Simple Equations, Problem on Ages, Ratio & Proportion, Variation& Partnership, Percentages, Profit, Loss& Discounts, Simple & Compound Interest, Averages & Allegations or Mixtures

Numbers, Divisibility, Decimal Fractions, LCM & HCF, Simplification, Sequence, Series & Progressions, Linear Algebra, Quadratic Equations & Inequalities, Theory of Equations. Sets, Relations & Functions, Surds & Indices, Logarithms

Reference Books

1 Quantitative Aptitude by R.S. Agarwal, SCHAND Publications, R.S. Agarwal, 2021, SCHAND Publications.

2 A Modern Approach to Verbal Reasoning by R.S. Agarwal, SCHAND Publications, R.S. Agarwal, 2021, SCHAND Publications.

CRTVQRL3V3 - CAMPUS RECRUITMENT: REASONING APTITUDE TRAINING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
CRTVQRL3V3	CAMPUS RECRUITMENT: REASONING APTITUDE TRAINING	CRT: RAT	R	0	0	0	8	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply principles of deductive logic to solve problems on syllogisms, Venn diagrams, etc	3	PO6
CO2	Apply principles of inductive logic to solve problems on assumptions and conclusions	3	PO6

Syllabus

Syllogism, Number& letter series, Number, letter & word Analogy, Odd man out, coding & decoding, Cubes & Dice, Logical Venn Diagrams

Statements & conclusions, statements & Arguments (Critical Reasoning), statements & Assumptions, logical connectives, Binary logic

Reference Books

1 A Modern Approach to Verbal Reasoning, R.S. Agarwal, 2022, SCHAND Publications.

2 Logical Reasoning for CAT, Arun Sharma, 2021, McGraw Hills.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Social Immersive Learning (SIL)

22UC0021 - SOCIAL IMMERSIVE LEARNING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22UC0021	SOCIAL IMMERSIVE LEARNING	SIL-1	R	0	0	0	4	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3	PO9
CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3	PO9
CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3	PO9
CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3	PO9
CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3	PO9

Syllabus

Extension Activities and Social Outreach activities (ESO)

Technology Clubs (TEC)

Liberal arts, creative arts and hobby clubs (LCH)

Innovation, Incubation & Entrepreneurship (IIE)

Health & Well Being (HWB)

Reference Books

1 The Innovators Mindset Empower Learning, Unleash Talent and Lead a Culture of Creativity, George Couros, 1, georgecouros.com.

2 Reality+: Virtual Worlds and the Problems of Philosophy, Douglas Thomas and John Seely Brown, 2022, W. W. Norton & Company.

3 Immersive Education Designing for Learning, Paula MacDowell, Jennifer Lock, 2022, Springer.

4 A New Culture of Learning, John Seely Brown, Douglas Thomas, 2011, CreateSpace Independent Publishing.

22UC0022 - SOCIAL IMMERSIVE LEARNING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22UC0022	SOCIAL IMMERSIVE LEARNING	SIL-2	R	0	0	0	4	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3	PO1, PO4
CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3	PO1, PO4
CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3	PO1, PO4
CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3	PO1, PO4
CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3	PO1, PO4

Syllabus

Extension Activities and Social Outreach activities (ESO)

Technology Clubs (TEC)

Liberal arts, creative arts and hobby clubs (LCH)

Innovation, Incubation & Entrepreneurship (IIE)

Health & Well Being (HWB)

Reference Books

1 The Innovators Mindset Empower Learning, Unleash Talent and Lead a Culture of Creativity, George Couros, 1, georgecouros.com.

2 Immersive Education Designing for Learning, Paula MacDowell, Jennifer Lock, 2022, Springer.

3 Reality+: Virtual Worlds and the Problems of Philosophy, Douglas Thomas and John Seely Brown, 2022, W. W. Norton & Company.

4 A New Culture of Learning, John Seely Brown, Douglas Thomas, 2011, CreateSpace Independent Publishing.

22UC0023 - SOCIAL IMMERSIVE LEARNING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22UC0023	SOCIAL IMMERSIVE LEARNING	SIL-3	R	0	0	0	4	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3	PO1, PO4
CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3	PO1, PO4
CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3	PO1, PO4
CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3	PO1, PO4
CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3	PO1, PO4

Syllabus

Extension Activities and Social Outreach activities (ESO)

Technology Clubs (TEC)

Liberal arts, creative arts and hobby clubs (LCH)

Innovation, Incubation & Entrepreneurship (IIE)

Health & Well Being (HWB)

Reference Books

1 The Innovators Mindset Empower Learning, Unleash Talent and Lead a Culture of Creativity, George Couros, 1, georgecouros.com.

2 Immersive Education Designing for Learning, Paula MacDowell, Jennifer Lock, 2022, Springer.

3 Reality+: Virtual Worlds and the Problems of Philosophy, Douglas Thomas and John Seely Brown, 2022, W. W. Norton & Company.

4 A New Culture of Learning, John Seely Brown, Douglas Thomas, 2011, CreateSpace Independent Publishing.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Minor Degree Courses (MIN)

23AD2102R - DATABASE MANAGEMENT SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD2102R	DATABASE MANAGEMENT SYSTEMS	DBMS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply fundamental database design principles, including normalization, to model complex data relationships.	3	
CO2	Develop efficient and secure database applications using Structured Query Language (SQL) and PL/SQL for data manipulation and retrieval.	3	
CO3	Implement and manage database systems with appropriate indexing techniques, query optimization strategies, and concurrency control mechanisms for efficient and reliable data access.	3	
CO4	Analyze and evaluate the suitability of emerging database technologies like NoSQL and Big Data for modern applications, considering security implications.	4	
CO5	Design and implement practical database solutions to solve real-world problems using appropriate database management system technologies and best practices.	6	

Syllabus

Introduction to databases, data models (ER Model), database management systems (DBMS) architecture. Entity-Relationship (ER) Modelling concepts, relationship types, cardinality and ordinality constraints. Relational model concepts, normalization process (1NF, 2NF, 3NF, BCNF) for data integrity.

Introduction to SQL, Data Definition Language (DDL) for schema creation and manipulation. Data Manipulation Language (DML) for data retrieval, insertion, deletion, and modification. Advanced SQL concepts: Joins (inner, outer), subqueries, aggregation functions, views, and data security using access control. Introduction to PL/SQL for procedural programming within the database.

Introduction to transaction management concepts (ACID properties). Concurrency control mechanisms (locking protocols) and recovery techniques (rollback, redo) to ensure data consistency. Indexing techniques (hashing, B-trees) for efficient data access. Query optimization strategies for improving query performance.

Introduction to NoSQL databases and their characteristics (key-value, document, graph). Big Data concepts, distributed storage and processing frameworks (Hadoop). Security considerations in database management systems, including access control, encryption, and intrusion detection.

Reference Books

1 Database Systems Concepts, Abraham Silberschatz, Henry Korth, S. Sudarshan, 2014, McGraw-Hill Education.

2 Introduction to Database Management Systems, R. Elmasri, Shamkant B. Navathe, 2016, Pearson Education.

3 PL/SQL Programming for Oracle, Steven Feuerstein, Bill Pribyl, 2011, O'Reilly Media.

4 Database and Application Security: Integrating Security in the Software Development Life Cycle, Rick Hoffman, 2016, Jones & Bartlett Learning.

5 Distributed Database Systems: Principles and Systems, Chhanda Ray, 2013, Pearson Education.

23CCF3101R - TCP/IP & OTHER PROTOCOL SUITE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CCF3101R	TCP/IP & OTHER PROTOCOL SUITE	TCP	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	The Architectural Evolution of TCP/IP, standards, Comparisons between OSI/ISO & TCP/IP Protocol Suite, different Addressing systems, ATM ARP ARP and their analysis	3	PO1, PO2, PSO2
CO2	Analyse DHCP Theory and Operation, DHCP Architecture, DHCP Auto-Configuration: Network Address Translation	3	PO2, PO3, PSO2
CO3	Analyse Domain Name system	3	PO2, PO3, PSO2
CO4	Analyse ICMPv4/v6, IGMP, MLD, UDP, IP Fragmentation, IP Sec, EAP][10-12](Error Formats)	4	PO2, PO3, PSO2
CO5	Analyse and deployment different protocols suites using Cisco packet tracer	4	PO2, PO5, PSO2
CO6	Analyse different protocols with type values using Wireshark	4	PO2, PO5, PSO2

Syllabus

Architecture: Brief History, Protocols and Standards, Standard Organizations, Internet Standards, Internet Administration, Architectural Evolution of TCP/IP TCP/IP Protocol Suite: Comparisons between OSI/ISO & TCP/IP Protocol Suite, Layers in the TCP/IP Protocol Suite, Addressing: Physical, Logical, Port and Application Specific Address. IP Addressing: (IPv4 and IPv6): Class full, Classless, CIDR, Special and Network Address Translation (NAT) The Address Resolution Protocol : Packet Formats, Encapsulation, Operation, Proxy ARP, ARP in LAN and WANATM ARP: Packet Format

DHCP Theory of Operation: Introduction, Operation, Allocation of DHCP: Remote, Automatic and Manual.,DHCP Architecture: DHCP Client, Server, Relay Agent, Process, Designing of DHCP: Setting up DHCP In A Small Office, DHCP Auto-Configuration: DHCP Client, Server, Relay Agent, Process, Network Address Translation: Methods of Translation, NAT, NAT Traversal, Dynamic Network Address translation.

DNS, Connection Mgt, Time-out, Data Flow, Congestion Cont., TLS, DNSSEC, DKIM [10-12] TCP: Principal, operational , Segment Structure of simplified TCP, TCP Connection Management: Connection Establishment, Transfer, Termination and Reset, Time out and Data flow (Error and Flow Control), Congestion control, (Congestion Control and avoidance algorithm(NEW Rano RFC 6582)) DNS: Distribution of Name Space and Defined Zones, DNS in Internet (Generic, Country and Reverse).

Advancement In Other Protocol Suites: ICMPv4/v6, IGMP, MLD, UDP, IP Fragmentation, IP Sec, EAP][10-12] ICMPv4/v6 : Datagram Structure of Internet Message Control Protocol V.4 (ICMPv4 & ICMP v6), Encapsulation in ICMPv4/v6, Common error messages in ICMPv4 Type 3 and ICMPv6 Type 1 Compare and contrast between ICMPv6 with ICMPv4.Internet Group Message Protocol (IGMP): Architecture, Versions, Messages with Access control.MLD, UDP, IP Fragmentation, IP Sec, EAP: Multicast Listener Discovery (MLD) and IGMP Windows Sockets, Extensible Authentication Protocol (EAP) standards and Mechanisms (IEEE 802.11, IEEE 802.1x)

Reference Books

1 TCP/IP Protocol Suite, Behrouz A.Ferouzan, 2009, Mc-Graw Hill.

2 The DHCP Handbook, Ralph Droms, and Ted Lemon, 2003, Pearson.

3 An Integrated Approach to Computer Networks, Bhavneet Sidhu, 2019, Khanna Publications.

4 Engineering Approach To Computer Networking, Srinivasan Keshav, 2002, Pearson Education(AICTE).

23CE2103R - SURVEYING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2103R	SURVEYING	SVY	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the knowledge of plane surveying, geodetic surveying for computation of bearings in a traverse.	2	PO4, PO8, PSO1
CO2	Apply and Calculate the difference in elevation by using differential levelling techniques and prepare a contour plan.	3	PO4, PO8, PSO1
CO3	Compute the area of the field and volume of earthwork	3	PO4, PO8, PSO1
CO4	Understand about the different types of curves and uses of GPS & GIS	2	PO4, PO8, PSO1
CO5	Evaluate Conceptualize the project by applying surveying techniques such as chain, compass, traverse.	4	PO4, PO8, PSO1
CO6	Calculate the height of building by using theodolite and tacheometric survey, and total station surveying	3	PO4, PO8, PSO1

Syllabus

Introduction to surveying, Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications. Distances and Direction - Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements, Meridians, Azimuths and Bearings, declination, computation of angle. Global and regional sustainability guidelines and regulations. Case studies of successful construction projects

Concept and Terminology, adjustments- method of levelling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting. Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

Theodolite, description, uses and adjustments, measurement of horizontal and vertical angles. Principles of Electronic Theodolite, Trigonometrical levelling, Traversing. Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

Types of curves, design and setting out of simple curves. Introduction, Accessories with description, Features of total station, Onboard software electronic data reading, Summary of total stations characteristics, Field procedure of total stations in topographic survey, Global positioning system, Introduction to Geographic information system (GIS).

Measurement of horizontal and vertical angles using theodolite, Determination of a given area using total station. Calculation of volume of earthwork using total station, staking out the points in an area using total station, Measurement of height of the tower/building using total station, Measuring and plotting using Auto cad of a given area of land by total station.

Reference Books

1 Elementary Surveying: An Introduction to Geomatics, Charles Ghislaine , 15, Pearson.

2 Surveying Vol-I, Arora K. R,, 10, Rajsons Publications Pvt. Ltd.

3 Surveying: Principles and Applications, Barry F. Kavanagh and Tom B. Mastin, 9, Pearson.

4 Surveying: Volume 1, B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, 14, Laxmi Publications.

23CE2105R - SOLID MECHANICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2105R	SOLID MECHANICS	SMN	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Solve response of free and forced vibrations	4	PO2
CO2	Solve response to Arbitrary, Step and Pulse Excitations (SDoF)	4	PO4
CO3	Solve Earthquake Response of Linear Systems (SDoF)	4	PO5
CO4	Build Generalized multi Degree of Freedom Systems	4	PO2, PSO1
CO5	Solve response of Multi -degree of freedom systems (MDoF)	4	PO4
CO6	Analyze the complex problems in solid mechanics using advanced methods and computational tools.	4	
CO7	Apply principles of equilibrium, compatibility, and material behavior to analyze stresses and strains.	3	

Syllabus

Introduction to Solid Mechanics , Basic concepts and principle, Types of loads and stresses, Deformation and strain, Stress strain relationships, Analysis of Axially Loaded Members, Axial stress and deformation , Shearing stress and deformation, Thermal stress and deformation

Analysis of Torsion, Torsional stress and deformation, Polar moment of inertia, Shear flow , Bending of Beams, Bending stress and deformation, Bending moment and shear force diagrams, Flexural stress and strain

Transverse Shear, Shear stress in beams, Shear flow in built up members, Combined Loading, Combined axial, torsional, and bending loads , Mohrs circle for stress analysis

Deflection of Beams, Differential equations of the deflection curve, Boundary conditions, Energy Methods, Strain energy and potential energy, Castiglianos theorem

Introduction to Stability, Buckling of columns and beams, Eulers formula, Introduction to Finite Element Method, Basics of FEM theory, Applications in solid mechanics

Mechanical Properties of Materials Material Behavior Elasticity, plasticity, and viscoelasticity Stress-strain curves Mechanical Properties Young\\\'s modulus, shear modulus, Poisson\\\'s ratio Yield strength, ultimate strength, fracture toughness Hardness and Fatigue Hardness testing methods Fatigue life and fatigue limit

Axial Load Axial Stress and Strain Axial deformation of bars Saint-Venant\\\'s principle Thermal Stress Stress due to temperature change Compound bars and thermal stress analysis Elastic Strain Energy Strain energy due to axial loads Resilience and toughness

Combined Loading Stress Analysis under Combined Loading Superposition principle Combined axial, torsional, and bending loads Stress Transformation Transformation of plane stress and strain Combined loading cases: Shaft under torque and bending, beam under bending and axial load

Reference Books

1 "Engineering Mechanics: Statics, J.L. Meriam and L.G. Kraige, , 2014, Wiley.

2 "Mechanics of Materials", Russell C. Hibbeler, , 2016, Pearson.

3 Mechanics of Materials, Russell Johnston Jr., John T. DeWolf, David F. Mazurek, 2018, McGraw-Hill Education.

4 Introduction to Solid Mechanics, Irving H. Shames, 2003, Prentice Hall..

23CE2206 - STRUCTURAL ANALYSIS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2206	STRUCTURAL ANALYSIS	STA	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Mastery of Structural Analysis Methods	3	PO1, PO5, PSO1
CO2	Ability to Analyze Complex Structures:	3	PO1, PO5, PSO1
CO3	Proficiency in Structural Modeling and Software Tools	3	PO1, PO5, PSO1
CO4	Understanding of Structural Behavior and Design Implications	3	PO1, PO5, PSO1
CO5	Evaluate the dynamic response of structures subjected to external forces and vibrations, including natural frequencies and mode shapes.	4	PO1, PO5, PSO1
CO6	Apply knowledge of structural analysis principles to solve practical engineering problems and design structural elements that meet safety and performance criteria.	5	PO1, PO5, PSO1
CO7	Demonstrate proficiency in using structural analysis software and computational tools to analyze and design structures efficiently and accurately.	3	PO1, PO5, PSO1

Syllabus

Introduction to Structural Analysis and Loads

Analysis of Determinate Structures

Analysis of Indeterminate Structures

Matrix Structural Analysis and Computer Applications

Dynamic Analysis of Structures ,Fundamentals of structural dynamics Free and forced vibration analysis of single and multi-degree-of-freedom systems

Plastic Analysis of Structures ,Plastic behavior of materials and structural elements Plastic analysis of beams, frames, and portal structures

Influence Lines and Moving Loads Construction and use of influence lines for determinate and indeterminate structures

Special Topics in Advanced Structural Analysis Nonlinear analysis of structures Stability analysis of structures

Reference Books

1 Structural Analysis, Aslam Kassimali, 2014, Cengage Learning.

2 Structural Analysis, R.C. Hibbeler, 2022, Pearson.

3 Structural Analysis, Russell C. Hibbeler, 2014, Pearson.

4 Matrix Analysis of Structures, Aslam Kassimali, 2011, Cengage Learning.

23CE2208A - GEOTECHNICAL ENGINEERING (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2208A	GEOTECHNICAL ENGINEERING	GTE	A	4	0	4	0	6

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply and Describe soils and determine their physical characteristics of given soils.	3	PO1, PO6, PSO1
CO2	Describe soils and determine their compaction characteristics and engineering characteristics of soil	3	PO1, PO6, PSO1
CO3	Apply the load carrying capacity of pile various soils and methods ,Determine the lateral earth pressure, stability of slopes and retaining walls.	3	PO1, PO6, PSO1
CO4	Apply the soil sample investigation and bearing capacity at various conditions and settlement.	3	PO1, PO6, PSO1
CO5	Apply total stress and effective stress methods of analysis to evaluate slope stability. and detailing of well foundations	3	PO1, PO6, PSO1
CO6	Demonstration about Soil general and engineering properties using Geotechnical Engineering laboratory	4	PO1, PO6, PSO1

Syllabus

Origin of Soils: Soil Origin, rock cycle. Phase Relations: Weight Relationships, Volume Relationships, Density and Unit Weight Relationships, Inter-relationships. Soil Classification: coarse grained soils, fine grained soils. IS soil classification Compaction: variables in compaction, laboratory tests, field compaction, specification and control. Effective Stress: Effective stress Principle, effective stress, pore water pressure, and total stress variation with depth, vertical normal stress due to overburden, capillary effects in soils.

SOIL COMPACTION: Laboratory tests on compaction test, Factors affecting compaction, Structure and engineering behavior of Compacted cohesive soils; PERMEABILITY: Permeability of stratified soil deposits, Indirect methods, Factors affecting permeability; SEEPAGE: Laplace Equation, Estimation of seepage using flownet

Pile Foundations: Use of piles, Types of piles, Construction, Selection of pile type, Types of foundations to suit subsoil conditions, Pile load capacity, Static formulae, Dynamic formulae, Load tests, on piles, Group action of piles, Load carrying capacity of pile groups, Negative skin friction, Piles subjected to uplift loads

SUBSOIL INVESTIGATION: Depth of Exploration, Methods of Exploration, Borings for exploration, Depth of exploration, Methods of exploration, Borings for exploration, Field tests Plate load test, Penetration test. SHALLOW FOUNDATIONS: Types of foundations and choice of foundations, Bearing capacities, Terzaghs bearing capacity theory, influence of water table on bearing capacity, safe bearing capacity of soil using IS Code: SETTLEMENT OF FOUNDATIONS: Settlement of shallow foundation, Allowable bearing pressure of granular soils based on standard penetration test value.

Soil General and Engineering Properties and Well Foundations: Types of wells and caissons, components of well foundation, shapes of wells, depth of a well foundation, forces acting on a well foundation.

Geotechnical Earthquake Engineering Seismic hazards and ground motion analysis Seismic design of foundations and retaining structures Liquefaction and its mitigation techniques

Reference Books

1 Geotechnical Engineering , N Sivakugan and Braga M Das, 2009, J. Ross publishing, 2009 .

2 Basic and Applied Soil Mechanics , By Gopal Ranjan and ASR Rao, , , 2007., New Age International Publishers .

3 Foundation Analysis and Design , J.E. Bowles , 1996, MacGraw Hill, .

4 Soil Mechanics and Foundation Engineering , V. N. S. Murthy's, 2002, CBS Publishers & Distributors Pvt. Ltd.

23CE2229F - ADVANCED CONSTRUCTION TECHNOLOGY (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2229F	ADVANCED CONSTRUCTION TECHNOLOGY	ACT	F	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understanding of advanced building materials, including their properties, applications.	2	PO1, PSO1
CO2	Apply modern construction techniques for efficiency, sustainability, and cost-effectiveness.	2	PO1, PSO1
CO3	Compare construction systems and technologies, traditional vs. modern, for best practices.	2	PO1, PSO1
CO4	Integrate BIM, AI, and IoT in construction project management and execution.	2	PO1, PSO1

Syllabus

Introduction to Advanced Construction Technologies Overview of the construction industry and technological advancements. Study of emerging trends and their impact on construction techniques.

Advanced Building Materials Detailed study of new-age materials like Graphene, Aerogels, and Self-healing concrete. Sustainability and environmental impacts of advanced materials.

Modern Construction Techniques Precast and Modular construction. Automated and robotic construction processes.

Advanced Construction Systems In-depth analysis of innovative structural systems and designs. Case studies of groundbreaking projects utilizing cutting-edge technologies.

Technology in Construction Management Use of BIM, AI, and IoT in construction. Future trends in construction management technology.

Reference Books

1 Construction Technology , Roy Chudley, Roger Greeno , 2005, Pearson Education Limited.

2 Building Construction Handbook , Roy Chudley, Roger Greeno , 2012, Routledge.

3 Modern Construction: Lean Project Delivery and Integrated Practices , Lincoln H. Forbes, Syed M. Ahmed , 2010, CRC Press.

4 Advanced Construction Technology , Roger Greeno , 1999, Routledge.

23CE4114 - CONSTRUCTION PROJECT MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE4114	CONSTRUCTION PROJECT MANAGEMENT	CPM	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Knowledge and Understanding about Construction and project planning	2	PO1, PO2, PO6, PSO1
CO2	Understanding about Techniques of planning, Resource scheduling of constructions.	2	PO1, PO2, PO6, PSO1
CO3	Understanding about Construction Cost, Monitoring and Control Supervision	2	PO1, PO2, PO6, PSO1
CO4	Understanding about PERT, Planning and Organizing construction site and resources	2	PO1, PO2, PO6, PSO1

Syllabus

Construction- unique features of construction, construction project types and features, phases of a project, agencies in involved and their methods of execution Construction project planning- stages of project planning: pre tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail, process of development of plans and schedules, work breakdown structure, activity lists, assessment of work content, estimating durations, sequence of activities, activity utility data

Techniques of planning- Bar charts, Networks: basic terminology, types of precedence relationships: finish to start, start to start, finish to finish, start to finish, Preparation of CPM networks: activity on link and activity on node representation and analysis of single relationship (finish to start) networks, computation of float values and semi critical path calendaring networks. Resource scheduling- Bar chart, line of balance technique, resource constraints and conflicts, resource aggregation, allocation smoothening and leveling

Monitoring And Control Supervision: Record keeping, Periodic progress reports, Periodical progress meeting, updating of plans: purpose, frequency and methods of updating, Common cause of time and cost overruns and corrective measures, Quality control: concept of quality, quality of constructed structure, use of manuals and checklist for quality control, role of inspection, basics of statistical quality control, safety and health on project site: accidents causes and effects cost of accidents, occupational and health problems in construction organising for safety and health.

PERT- Assumptions underlying pert analysis data mining free time estimates analysis computation calculation of probability of completion Planning and Organizing construction site and resources- Site: site layout, developing site organization, record keeping at site, manpower planning, organising, staffing, motivation, Materials: concept of planning, procurement and inventory control, Equipment: Basic concepts of planning and organising, Funds: cash flow, sources of funds. Construction Cost: classification of costs, time cost trade off in construction project compression and decompression.

Reference Books

1 Construction Engineering and Management , Dr.S.Seetharaman; Umesh publications, Nai sarak, , 2019, Khanna Publishers.

2 Fundamentals of PERT/CPM and Project Management , S. k. Bhattacharjee, 2019, Khanna Publishers.

3 Construction Management and Planning , B.Sengupta and H.Guha, 2010, Tata Mc Graw- Hill Publishing co. ltd, New Delhi.

4 Construction planning, Equipment and Methods , Peurifoy R., 2015, Tata Mc Graw- Hill Publishing co. ltd, New Delhi.

23CI2001 - ADAPTIVE SOFTWARE ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CI2001	ADAPTIVE SOFTWARE ENGINEERING	ASE	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate understanding of software development life cycle, associated process models, and reverse engineering techniques.	3	PO1, PO2, PO3, PSO3
CO2	Apply requirement modeling, Agile, and Extreme Programming methodologies.	3	PO2, PO3, PO4, PSO3
CO3	Analyze Agile models including Scrum, Kanban, and SAFe methodology, analyze the use of JIRA for project monitoring, and identify appropriate design patterns for project development.	4	PO2, PO3, PSO3
CO4	Analyze testing strategies and evaluate risk management factors	4	PO1, PO2, PO3, PSO3

Syllabus

Software and Software Engineering: Nature of software, software application domains, unique nature of web applications, software engineering, software process, product and process , software engineering practice, software myths.

Process Models: Generic process model, prescriptive process models, specialized process models, unified process, personal and team process models, product and process, Reverse Engineering

Requirements elicitation, documenting business requirements, defining user requirements, and related concepts such as requirement analysis techniques, stakeholder engagement, and requirement validation processes

Agile methodologies like Scrum and Kanban, SAFe for scaling agile, project monitoring with JIRA, and design patterns including architectural and model-driven approaches. Agile project management, scaling frameworks, tool usage for tracking progress, and advanced software design principles for robust architectures.

A strategic approach to software testing, strategic issues, test strategies for conventional software, Black-Box and White-Box testing, validation testing, system testing. RISK MANAGEMENT

Reference Books

1 Software Requirements, Karl Wiegers and Joy Beatty, 3 (2012), Microsoft Press..

2 Scaling Lean & Agile Development: Thinking and Organizational Tools for Large-Scale Scrum, Craig Larman and Bas Vodde, 1 (2008), Addison-Wesley Professional.

3 The Mythical Man-Month: Essays on Software Engineering, Fred Brooks, Anniversary Edition,(1995), Addison-Wesley Professional.

4 Code Complete: A Practical Handbook of Software Construction, Steve McConnell, 2 (2004), Microsoft Press.

5 The Art of Software Testing, Glenford J. Myers, Corey Sandler, and Tom Badgett, 3rd Edition (2011), John Wiley & Sons.

23CS2104R - OPERATING SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CS2104R	OPERATING SYSTEMS	OS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand subsystem components of the Kernel and apply the CPU Scheduling algorithms.	2	PO1, PO2, PSO1
CO2	Apply the memory and process virtualization and Paging, apply Page Replacement Algorithms	3	PO2, PSO1
CO3	Apply the Concurrency and apply different Lock Algorithms & Solve Synchronisation Problems	3	PO2, PO3, PSO1
CO4	Apply the knowledge of persistence concepts, Redundant disk arrays, File System Implementation, Inter-process Communication and Distributed Systems. Apply Disk Scheduling Algorithms.	3	PO2, PO3, PO7, PSO1
CO5	Evaluate Unix System Calls. Use C Programming Language to implement Operating System Concepts (Practicals)	5	PO2, PO3, PO7, PSO1

Syllabus

"Basics: Operating System Functionalities, Types of Operating Systems, Process Virtualization: Processes, Process API code, Direct Execution, CPU Scheduling, Multi-level Feedback, Lottery Scheduling code, Multiprocessor Scheduling.

"Basics: Operating System Functionalities, Types of Operating Systems, Process Virtualization: Processes, Process API code, Direct Execution, CPU Scheduling, Multi-level Feedback, Lottery Scheduling code, Multiprocessor Scheduling.

"Concurrency: Concurrency and Threads code, Thread API, Common concurrency problems, Locks, Locked Data Structures, Condition Variables, Mutex, Semaphores, Monitors, Deadlock: Prevention, Detection and Avoidance.

Persistence: I/O Devices, Hard Disk Drives, Disk Scheduling Algorithms, Redundant Disk Arrays (RAID), Files and Directories, File System Implementation, Distributed systems, Data Integrity and Protection, Inter-process communication.

BASIC COMMAND WITH EXAMPLES, IMPLEMENTATION OF FILE OPERATIONS, PROCESS API, PROCESS SCHEDULING ALGORITHMS, MEMORY MANAGEMENT, MEMORY ALLOCATION TECHNIQUES, PAGE REPLACEMENT TECHNIQUES, DEADLOCKS, CONCURRENCY, DISK SCHEDULING ALGORITHMS, INTER PROCESS COMMUNICATION, FILE ORGANIZATION

Reference Books

1 Operating Systems: Three Easy Pieces, Remzi H. Arpaci-Dusseau and Andrea C. Arpaci- Dusseau, 2015, May, (2014).

2 Operating system concepts essentials., Silberschatz, A., Galvin, P.B. and Gagne, G.,, 2013, John Wiley & Sons, Inc..

3 Modern operating system, Tanenbaum, 2009, Pearson Education, Inc..

4 Operating Systems: A Concept-based Approach, D. M. Dhamdhere, 2012, 2E Tata McGraw-Hill Education.

23CS2205R - DESIGN AND ANALYSIS OF ALGORITHMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CS2205R	DESIGN AND ANALYSIS OF ALGORITHMS	DAA	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply concepts of mathematics to find space complexity, time complexities of various algorithms	3	PO2
CO2	Analyze the problems that can be solved by using Divide and Conquer and Greedy Method	4	PO2
CO3	Analyze the problems that can be solved by using Dynamic Programming and Backtracking	4	PO2
CO4	Analyze the problems that can be solved by using Branch and Bound, NP-Hard Graph problems and Approximation Algorithms	4	PO2
CO5	Solve and Analyze the complex and realtime problems by various design strategies	4	PO2
CO6	Analyze the various design techniques to solve any real-world problems	4	

Syllabus

Introduction, Definition of an Algorithm Algorithm Specification Analysis of Algorithm PRAM Algorithms Merging Sorting. String Algorithms The Naive String Matching Algorithm, Robin Karp Algorithm.

Divide and Conquer, Merge Sort, Quick Sort, Strassens Matrix Multiplication, Convex Hull. Greedy Method, The General Method Job Sequencing with Deadlines, Knapsack Problem, Minimum Cost Spanning Trees, Huffman Codes, Single Source Shortest Path Method.

Dynamic Programming, The General Method Optimal Binary Search Tree, 0/1 Knapsack, Traveling Sales Person Problem, Ford Fulkerson. Backtracking The Eight Queens Problem, Graph Coloring, Knapsack Problem.

Brand Bound 0/I Knapsack Problem, Traveling Sales Person Problem. NP Hard and NP Complete Problems, Basic Concepts Cooks Theorem, NP Hard Graph Problems, CDP, NCDP, AOG

KMP Algorithm, Sum Of Subset Problem, Approximation Algorithms Introduction, Planar Graph Coloring, Maximum Programs stored problem, NP-Hard Absolute approximation

Reference Books

1 Fundamentals of Computer Algorithms1, Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, 2nd Edition, 2008, University Press.

2 Introduction to algorithms, Cormen, Leizerson&Rivest, 3rd Edition, 2002, Prentice-Hall.

3 Algorithm Design, Jon Kleinberg and Eva Tardos , 4th edition, 2006, Pearson Education.

4 Algorithms , Robert Sedgewick and Kevin wayne, 4th edition,2011, Addison Wesley Prof., .

5 Introduction to Design and Analysis of Algorithms, Anny Levitin, 2nd Edition,2007, Person Education Press. .

23CSB3101R - CRYPT ANALYSIS & CYBER DEFENSE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CSB3101R	CRYPT ANALYSIS & CYBER DEFENSE	CACD	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Classical Encryption Techniques and Symmetric Encryption algorithms to convert a given Plaintext to Cipher text.	3	PO1, PO2, PSO3
CO2	Apply RC4 Algorithm, Block Cipher Modes of Operation and Multiple Encryption for given plaintext.	3	PO1, PO2, PSO3
CO3	Apply Public key Crypto Systems to ensure Secure communication of data.	3	PO1, PO2, PSO3
CO4	Apply Hash, MAC algorithms and Digital Signatures to achieve Message Authentication and Integrity..	3	PO1, PO2, PSO3
CO5	Implement security goals like Confidentiality, Integrity, Authentication algorithms.	3	PO1, PO3, PSO3
CO6	Analyze social engineering, Ethical Hacking & Incident Responses using various tools..	4	PO1, PO5, PSO3

Syllabus

Introduction to Security: Security Concepts, Security Attacks, A Security Model, Security , Services and Mechanisms, Antivirus bypassing, Password Attacks and Web browser exploitation. Block Ciphers: DES, DES Example, Strength of DES, Differential and Linear Cryptanalysis., AES: Finite Field Arithmetic, AES Structure, AES Transformation Functions, AES Example. Multiple Encryption and Triple DES.

Modes of Operation. Pseudorandom Number Generation: Principles and Pseudorandom Number, Generators, Pseudorandom Number Generation using a Block Cipher, Stream Ciphers. Stream Ciphers: RC4.

Public-key Cryptography: RSA algorithm, Diffie-Hellman Key Exchange, ElGamal Cryptosystem, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Cryptographic. Hash Functions: Applications of Cryptographic Hash functions, Two Simple Hash Functions, Requirements and Security, SHA 512, MD5..

Reference Books

1 Cryptography and Network Security Principles and Practice, William stallings, 5th Edition, 2010, Pearson.

2 Applied Cryptography: Protocols, Algorthms, and Source Code in C, Bruce Schneier, Second Edition, 2015, John Wiley & Sons.

3 Cyber Security Incident Management Guide, Gerard Johansen, Third Edition, 2017, Packt Publishing Ltd.

4 Applied Cryptography for Cyber Security and Defense: Information Encryption and Cyphering, Hamid R. Nemati and Li Yang, Second Edition, 2011, IGI Global.

5 Cryptography and Network Security, Forouzon B, Indian Edition, 2010, TMH (2010)..

23CSB3202R - NETWORK AND INFRASTRUCTURE SECURITY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CSB3202R	NETWORK AND INFRASTRUCTURE SECURITY	NIS	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand security concepts, Infrastructure security techniques and securing enterprise networks. Understand router and switching security mechanism	2	PO3, PSO1
CO2	Understand hardware procedures for digital certificate and techniques of user authentication	2	PO3, PSO1
CO3	Appy the standardization schemes to maintain security in Web application and secured payment system. Identify security vulnerability in the system	3	PO3, PSO1
CO4	Apply security concepts in Email and Internet Protocol	3	PO3, PSO1

Syllabus

Network Hardware, Software and Services, Hardware Protection, Intruders and Virus. Network Management Security, Device security, Virtual Private Networks (VPNs), Data Center and Enterprise Networks Security, Securing a Wireless LAN, LAN Switch Security, Router and switching mechanisms for Security, Queuing and Scheduling Algorithms

Key distribution - Symmetric encryption, Key distribution - Asymmetric encryption, Public-Key Infrastructure, distribution of public keys, X.509 Certificates, Remote User Authentication using Symmetric Encryption, Remote User Authentication Using Asymmetric Encryption, Kerberos

Web Security and issues, Secure Sockets Layer Concepts, Transport Layer Security, HTTPS, Secure Shell (SSH), Secure electronic transaction (SET), SET Payment processing Security vulnerabilities Scanning techniques, Vulnerability assessment, Penetration testing

Pretty Good Privacy, S/MIME Domain Keys Identified Mail IP Security Overview, IP Security Policy Encapsulating Security Payload, Combining Security Associations Firewalls and Gateways, Intrusion detection system

Reference Books

1. Cryptography and Network Security Principles and Practice, William Stallings, 7th Edition, Pearson Education, 2017.
2. Cryptography And Network Security, Behrouz A. Forouzan, Debdeep Mukhopadhyay, 4th Edition, TataMcGraw Hill Education Private Limited, 2015.
3. Network Security Essentials, William Stallings, 7th Edition, Pearson Education, 2017.
4. Network Security, Charlie Kaufman, Radia Perlman, Mike Speciner, 2nd Edition, Prentice Hall.

23CSB3203R - INTRODUCTION TO BLOCKCHAIN AND CRYPTO CURRENCIES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CSB3203R	INTRODUCTION TO BLOCKCHAIN AND CRYPTO CURRENCIES	IBCC	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding or knowing the basic concepts of Cryptography for Blockchain	2	PO1, PSO1
CO2	Understand the basics of Blockchain and mining process	2	PO1, PSO1
CO3	Apply about the different types of Blockchain and consensus algorithms	3	PO1, PO2, PSO1
CO4	Apply the different types of crypto currencies & its importance and Blockchain applications	4	PO2, PSO1
CO5	Apply and analyze basic cryptography concepts and smart contracts applications using soft wallet.	5	PO2, PSO1

Syllabus

Introduction to Cryptography: Structure of cryptosystem - symmetric key cryptography -asymmetric key cryptography - types of attacks - RSA algorithm - Elliptic Curve Cryptography (ECC) -authentication models - SHA-256 Hash algorithm - Digital Signature Standards (DSS) - Elliptic CurveDigital Signature Algorithm (ECDSA).

Basics of Blockchain concepts Architecture Properties ofBlockchain Distributed ledger Merkle tree structure of a Block Smart contract Crowd funding Transaction Double spending Block propagation Consensus Protocols Proof of Work PoW Proofof Stack PoS Proof of Burn PoB Proof of Elapsed Time PoET PAXOS consensus RAFTconsensus Delayed Proof of Work dPoW Delegated Proof of Stake DPoS Byzantine general problem Byzantine Fault Tolerance BFT Delegated Byzantine Fault Tolerance dBFT Practical Byzantinefault tolerance Algorithm

Three phase commit Protocol Mining Types of Blockchain Blockchaincomponents Permissioned Blockchain Permissionless Blockchain Consortium BlockchainCryptocurrencies Cryptocurrencies applications using Blockchain Bitcoin Bitcoin properties Transaction life cycle creation of coin sending payments double spending using Blockchain bitcoinanonymity

Tangle IOTA Ether ETH Ethercoin properties smart contract Applications FinancialServices Cross border payments KYC international trade Health Care Food safety Applications ofBlockchain Blockchain based Internet of Things BIoT Supply Chain Management and Healthcare etc

Reference Books

1. Cryptography and Network Security: Principles and Practice , William Stallings, 7th Edition, Pearson Education.
2. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction , Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, , -, Princeton University Press.
3. Blockchain: Blueprint for a New Economy , Melanie Swan, -, O'Reilly Media, Inc.
4. Bitcoin: A Peer-to-Peer Electronic Cash System , Satoshi Nakamoto, -, 2018 Annual Seminar Bitcoin Glossary.
5. ETHEREUM: A Secure Decentralized Transaction Ledger, , Dr. Gavin Wood, , -, Paper EIP-150 REVISION.

23CSB3304R - DIGITAL FORENSICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CSB3304R	DIGITAL FORENSICS	DF	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Forensic Science and Digital Forensics	3	PO1, PSO3
CO2	Apply Operating System and File System Forensics	3	PO1, PO2, PSO3
CO3	Analyze Digital Evidence and Network Forensics	4	PO1, PSO3
CO4	Evaluate Web Forensics and Mobile Device Forensicss	5	PO1, PSO3
CO5	Implement and Evaluating the concepts of Digital Forensics	5	PO5, PSO3
CO6	Implement and Evaluating acquisition methods for digital evidence related to system security	5	PO5, PSO3

Syllabus

Digital Forensics and Incident Analysis: History of Forensic Science, Locard\'s exchange principle, Crime Reconstruction, Investigations, Evidence Dynamics, Digital Forensics and Its Environment: Forensic Soundness and Fundamental Principles, Digital Forensics, The Digital Forensics Process, Types of Evidence, Evidence Collection Order, Chain of Custody, Data Integrity and Preservation, Attack Attribution, The MITRE ATT&CK Framework, The Cyber Kill Chain, The Diamond Model of Intrusion Analysis, Incident Response, NIST Incident Response Life Cycle.

OS and File Systems Forensics: Describing computers and the nature of digital information, operating systems, describing filesystems that contain evidence, locating evidence in filesystems, explaining password security, encryption, and hidden files, Case studies: Linking the evidence to the user. Digital Evidence: Defining digital evidence and its characteristics, the technical complexities of digital evidence

Determining the value and admissibility of digital evidence, Case study: linking the evidence to the user.Digital evidence and its characteristics. Network Monitoring and Tools: Introduction to Network Monitoring, Network Security Topology, Network Monitoring Methods, Network Taps, Traffic Mirroring and SPAN, Network Security Monitoring Tools, Network Protocol Analyzers, NetFlow, SIEM and SOAR. IP Vulnerabilities, ICMP Attacks, Amplification and Reflection

Address Spoofing Attacks, TCP Attacks, UDP Attacks, Defence-in-Depth, Assets, Vulnerabilities, Threats, The Security Onion, and The Security Artichoke. Examining Browsers, Ontologies for Mobile and Embedded Forensics, The rowing challenge of evidence recovery from mobile phones and handheld devices, Case study: Mobile phone evidence in a bomb hoaxE-mails, Messaging Systems, and Mobile Phones: Locating evidence from Internet browsing, Messaging systems, E-mail analysis and the processing of large e-mail databases,

Reference Books

1 Fundamentals of Network Forensics: A ResearchPerspective, R.C. Joshi, Emmanuel S. Pilli, , 2018, Springer.

2 Computer Forensics and Cyber Crime : An Introduction, MarjieT.Britz, 2013, Prentice Hall.

3 Practical Digital Forensics, Richard Boddington, 2016, Packt Publishers.

4 Digital Forensics, AndreArnes, 2017, John Wiley & Sons Ltd, 2018..

23CSB3405M - DATABASE SYSTEM AND SECURITY (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CSB3405M	DATABASE SYSTEM AND SECURITY	DSS	M	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Database Users, Roles related to User Administration and Java concepts.	2	PO2, PSO1
CO2	Apply Data Encryption and Database Vaults.	3	PO5, PSO1
CO3	Apply secret password Encryption & Decryption.	3	PO3, PSO1
CO4	Apply Data Encryption for the Data in Transit.	3	PO5, PSO1

Syllabus

Oracle users and Schema: Oracle users and Schema: Oracle database security New features. Db users and schemas, Working as the SYS User, System Privileges, Roles, The DBA Role, The Create-Session Role, Password-Protected Roles, Security Administrator User, Security Administration Role Verification, Security Administrator Role Acquisition, System Privileges Granted to the Security Administrator Role, Working as the Security Administrator, Acquire secadm_role from a SQL*Plus Local Connection, Toggle Between Roles, Create an Application Security User and roles, create an Application user ,Create HR View role, Oracle Java Database Connectivity, Java Packages, Environment, Java Stored

Transparent Data Encryptson, Encryption Data stored in database, protecting data, Viewing Data, TDE Setup- Oracle 10g, Oracle wallet, TDEs Key Management, Creating Encrypted columns in a table, Salt viewing encrypted columns, Encrypting an existing column, Table space Encryption, Oracle by Configuration, Exporting, Importing Encrypted Data. Oracle database vaults- Installing Oracle Database Vault, Realm Protection Patterns, creating first realm, Accessing realm Protection objects, Realm Components, Realm objects, Realm Authorization, Managing Role Provisioning with database, vault realm authorization, Realm and DBV Administrator, Realm authorization and objects owner Account, realm authorization controlled with DBV rule set, command rules, Components, Commands supported in Command rules, DBV connect command rule, Rule Sets, Factors.

Secret Password Encryption- Generating the Password and Artifacts, Calculating the Size of the Password, Initializing Static Class Members, Negotiated Algorithm, Encrypting with the Public RSA Key, Returning Secret Password Key Artifacts to the Client, Encrypting Data with Our Secret Password. Oracle Structures for Secret Password Encryption Package to Get Secret Password Artifacts and Encrypted Data, Application Security Package Specification, Application Security Package Body- Functions, Application Security Package Body: Procedures, Java Methods for Secret Password Decryption.

Data Encryption in Transit Granting More System Privileges to the Application Security User, Permitting Users to Execute Packages in Other Schemas, Application Security User Activities, Creating a Table for Error Logging, Creating a Table for Managing Our Error Log Table, Creating an Error Log Management Procedure, Creating a Trigger to Maintain the Error Log Table, Testing the Trigger, Updating the Application Security Package, Methods for Using and Testing Encryption in Transit, Loading Updated Oracle Java Secure Class into Oracle, Security Structures for the HR User, Logging the Error Message, Procedure Variables and Data Decryption, Integrity Constraint on Employees Table, Avoiding SQL Injection, Demonstrating Failure to SQL Inject in Stored Procedure, Executing the HR Package Specification and Body, Demonstrations and Tests of Encrypted Data Exchange, Sending Encrypted Data to Oracle Database for Insert/Update, Testing Encryption Failure with New Client Keys, Testing Failure with New Oracle Connection, Running Basic Key Exchange Without Data Encryption, Packaging Template to Implement Encryption.

Reference Books

1 Expert Oracle and Java Security: Programming secure Oracle Database Applications with Java, David Coffin, ., A.Press, L.P,2011.

2 Applied Oracle Security: Developing Secure Database and Middleware, David C. Knox Scott G. Gaetjen, Hamza Jahangir, Tyler Muth, Patrick Sack, Richard Wark, Bryan Wise, -, Tata McGraw Hill, 2010..

3 Database Security and Auditing, Hassan A. Afyouni, -, Cengage Learning, 2005.

4 Implementing Database Security and Auditing: Includes Examples for Oracle, SQL Server, Db2 Udb, Sybase, Ben-Natan, R. B., -, Digital Press 2005.

23CSB3406M - PROGRAMMING FOR SMART CONTRACTS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CSB3406M	PROGRAMMING FOR SMART CONTRACTS	PSC	M	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Ethereum blockchain and using wallet for interacting with network	3	PO1, PO3
CO2	Compare and Contrast different methods of contract deployment and interaction.	4	PO2, PSO3
CO3	Evaluating advanced smart contracts with various test setups and try-catch	5	PO4, PSO3
CO4	Evaluating interactive front end for smart contracts and use Contracts design patterns.	5	PO3, PO4

Syllabus

Ethereum Ethereum basics Wallet Technology Nondeterministic Wallets Deterministic Wallets Hierarchical Deterministic Wallets Ethereum Addresses accounts Ethers Ethereum networks Consensus Protocols Ethereums ProofofWork Algorithm Ethash Ethereums ProofofStake Algorithm Casper Delegated Proof of Stake DPoS

Ethereums Cryptographic Hash Function Keccak256 mining on Ethereum Ethereum Virtual Machine EVM Smart contract Ethereum Name Service ENS managing contracts with wallet Ethereum wallets and transactions deploy and interact with contracts Ethereum app architecture Solidity Programming Language Contract structure Data Types Predefined Global Variables and function declarations Functions function modifiers Overview of Arrays overview of mapping and structs Pseudo random generator Gas and transactions Mnemonic phrases compiling solidity the Compile script contract deployment The Structure of a Transaction testing with remix redeploying contracts

Advanced Smart contracts Sending ether from contracts resetting contracts state trycatch assertions testing function modifiers Contract Constructor and selfdestruct Adding a Constructor and selfdestruct Contract Inheritance Error Handling assert require revert Events Calling Other Contracts send call callcode delegatecall Gas Considerations Avoid Dynamically Sized Arrays Avoid Calls to Other Contracts The lottery contract Lottery design Smart Contract Security

Building interactive front end CreateReactapp Web3 setup deploying contracts local contracts instances rendering contract data Form setup Contracts Design Patterns Contract selfdestruction pattern Factory contract pattern Name Registry pattern Mapping iterator pattern Setting up private blockchain network Boot node toolpeer discovery setting up a PoAClique Network Clique based private network testing ERC20 token specifications ERc20 token implementation

Reference Books

1. Ethereum Smart Contract Development in Solidity, by Gavin Zheng (Author), Longxiang Gao (Author), Liqun Huang (Author), Jian Guan (Author), 2020, Paperback.
2. Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, by Lorne Lantz (Author), Daniel Cawry (Author), 2020, Paperback.
3. Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners, Chris Dannen, 2017, Apress.
4. Mastering Ethereum: Building Smart Contracts and DApps, Andreas M. Antonopoulos and Gavin Wood, 2019, O'Reilly.

23CSB3510 - SECURITY GOVERNANCE & MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CSB3510	SECURITY GOVERNANCE & MANAGEMENT	SGM	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	The students understand the fundamental principles of security governance and management, including their necessity and implementation strategies. They will also gain a thorough grasp of access management techniques like authentication, authorization, and access control.	2	PO1, PO4, PO5
CO2	The student will be able to apply knowledge of security frameworks (COBIT, CMMI, ISO) and risk management principles to define strategic security metrics aligned with governance objectives and information security outcomes. This outcome focuses on applying the listed topics (frameworks, risk management) to achieve a practical goal: defining security metrics that meet both governance and security goals.	3	PO3, PO4, PO5
CO3	By Apply current security & risk landscapes, students will be able to apply knowledge to implement comprehensive security strategy, including identifying gaps, defining success metrics, and adapting to challenges.	3	PO3, PO4, PO5
CO4	Applying Incident Management and Response Metrics to various organizations	3	PO1, PO4, PO5

Syllabus

Governance Overview How Do We Do It What Do We Why Governance Benefits of Good Governance A Management Problem Legal and Regulatory Requirements Security Governance and Regulation Roles and Responsibilities The Board of Directors Executive Management Security Steering Committee The CISO CIA Model User identity and Access Management Authentication Account Authorization Validation Access Control

Strategic Metrics Governance Objectives Information Security Outcomes Defining Outcomes Security Governance Objectives Security Architecture CobiT Capability Maturity Model ISO IEC 27001 27002 63 Other Approaches Risk Management Objectives Risk Management Responsibilities Managing Risk Appropriately Determining Risk Management Objectives

Current State Current State of Security Current State of Risk Management Gap Analysis Unmitigated Risk Developing a Security Strategy Failures of Strategy Attributes of a Good Security Strategy Strategy Resources Strategy Constraints Sample Strategy Development The Process Implementing Strategy Action Plan Intermediate Goals Action Plan Metrics Reengineering Inadequate Performance Elements of Strategy.

Security Program Development Metrics: Information Security Program Development Metrics ,Program Development Operational Metrics ,Information Security Management Metrics: Management Metrics ,Security Management Decision Support Metrics ,CISO Decisions , Incident Management and Response Metrics: Incident Management Decision Support Metrics.

Reference Books

1 INFORMATION SECURITY Governance A Practical Development and Implementation Approach, KRAG BROTBYA, 2009, WILEY.

2 Information Systems Security: Security Management, Metrics, Frameworks And Best Practices, Nina Godbole, 2010, ISC2 Press.

3 Information Security Risk Analysis , Thomas R. Peltier, 3rd edition, Auerbach, 2012.

4 Principles of Information Security, Michael E. Whitman, 5 edition (2015), Cengage Learning India Private Limited .

5 Fundamental of Information Security, Sanil Nadkarni , 2020, bpb.

23EC1202 - DIGITAL DESIGN & COMPUTER ARCHITECTURE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC1202	DIGITAL DESIGN & COMPUTER ARCHITECTURE	DDCA	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Build the combinational and programmable digital logic circuits using logic gates and optimization methods	3	PO1, PO2, PSO1
CO2	Construct the sequential and memory circuits using flip-flops	3	PO1, PO2, PSO1
CO3	Organize computer architecture and instructions sequence	3	PO1, PO2, PSO1
CO4	Model the Memory Architecture and I/O Organization modules	3	PO1, PO2, PSO1
CO5	Develop and analyze computer architecture modules using basic combinational, sequential and memory logics	4	PO1, PO3, PO5, PSO1

Syllabus

Combinational Digital Logic Circuits: Boolean algebra, Digital Logic SOP/POS representation and optimization techniques. Adders, Subtractors, Multiplexers, De-Multiplexers, Decoder, Encoder. Programmable Logic Devices: PROM, PAL, and PLA design. Implementation of CPLD (Macrocells) and FPGA (CLB/LUT) based digital logic modules and their applications.

Design of Sequential and Memory Circuits: Latches and Flip-Flops, Modeling of memory and registers, Timing and sequence control modules using Asynchronous/Synchronous counters, Ring and Johnson counter as timing and control units. Shift registers, Random Access Memory (RAM) and Memory decoding.

Basic Computer Architecture and Instructions: Features of Micro Computer, Operands, Addressing modes, Instruction formats, Machine cycle, Instruction sets, subroutine call and return mechanisms. Instruction set architectures - CISC and RISC architectures. Hardwired realization vs micro-programmed realization, multi-cycle implementation. Instruction level parallelism, instruction pipelining and pipeline hazards.

Memory Architecture and I/O Organization: Storage systems, introduction to memory hierarchy: importance of temporal and spatial locality; main memory organization, cache memory: address mapping, block size, replacement, and store policies; virtual memory system: page table and TLB. External storage; IO fundamentals: handshaking, buffering, programmed IO, interrupt driven IO.

Reference Books

1 Computer System Architecture, M. Moris Mano , 2017, Pearson/PHI.

2 Fundamentals of Digital Logic with Verilog HDL, Stephen Brown and ZvonkoVranesic, 2013, Mc Graw Hill.

3 Computer Organization and Design, DA Patterson and JL Hennessy, 2007, Morgan Kaufmann Publisher.

4 Computer Architecture and Organization, JBaljinder Singh, 2019, Mc Graw Hill.

5 Digital Circuits and Design, S. Salivahanan and S. Arivazhahan, 2018, Oxford Press.

6 Computer Organization and Architecture, W. Stalling, 2006, PHI.

23EC1203 - BASIC ELECTRICAL AND ELECTRONIC CIRCUITS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	BEEC	R	2	0	0	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts of circuits and its fundamentals	2	PO1, PSO1
CO2	Grasp the principles of AC circuits, including sinusoidal waveforms, impedance, and power factor.	2	PO1, PSO1
CO3	Comprehend the behavior of basic electronic components, such as diodes, and transistors.	2	PO1, PSO1
CO4	Understand the basic functional Principles of analog and digital ICs.	2	PO1, PSO1

Syllabus

Basic circuit elements, Circuit fundamental: Mesh analysis and Nodal analysis, Thevenin\'s theorem, Norton\'s theorem, Superposition theorem, Maximum power transfer theorem.

AC fundamentals: RMS value, Average Values, Form & Peak factor, Steady state analysis (R, L, C, etc), Reactance, Impedance, Phase & Phase difference, Real power, Reactive power, Power factor.

Operation of the diode, Diode as a switch, Rectifiers, Clipper, Clampers, Zener Diode as a regulator, Operation of Transistor, Transistor as a switch.

Analog & Digital ICs: Voltage regulators 7805, 7905, and LM723, Operational Amplifiers IC 741, Timer IC 555, Comparators LM 339.

Reference Books

1 Electrical Circuit Theory and Technology, John Bird, 2009, Routledge publishers.

2 Electronic Devices and Circuit Theory, Robert L. Boylestad, 2011, Pearson.

3 Electronic Devices and Circuits, David A. Bell, 2015, Oxford Press.

4 Circuits and Networks: Analysis and Synthesis, A Sudhakar, Shyam Mohan S Palli, 2010, MG Hill.

23EC2105R - SIGNALS & COMMUNICATION SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2105R	SIGNALS & COMMUNICATION SYSTEMS	SCS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic Continuous Time Signals and Systems	1	PO1, PSO3
CO2	Solve the frequency domain challenges and applications to systems	2	PO2, PO3, PSO3
CO3	Interpret the principles of linear and angle modulation and demodulation techniques.	2	PO1, PSO3
CO4	Analyze the analog transmitters and receivers in the presence of noise	3	PO2, PO3, PSO3
CO5	Analyze the signal conditioning and communication methodologies	4	PO2, PO5, PSO3

Syllabus

Exploration of Basic Signals and Systems - Introduction to Signals: Classification of Signals, BasicElementary Signals, Sinusoidal and Exponential Signals, Singularity Functions, Introduction to Systems: Classification of Systems, Linear Time Invariant (LTI) System, Impulse Response, Convolution and Interconnections of LTI Systems.

Frequency Domain Analysis of Signals - Concepts of Orthogonality, BriefTreatment of Fourier Series, Fourier Transform (FT): Introduction to FT and Inverse FT, FT of Standard Signals, Periodic Signals and Properties of Fourier Transforms, LT and its Applications to Systems. Sampling of Analog Signals - Frequency Domain Analysis.

Basic Communication Theory - Need for Modulation,Frequency Translation Methods, Amplitude Modulation and Angle Modulation, Modulation Index, Spectrum ofAM and FM Signal, Transmission Bandwidth and Efficiency, Modulators and Demodulators of AM and FM: Envelope Detector, Balanced Modulator, Synchronous and Asynchronous Detectors, FM Demodulation Employing First Order PLL.

Radio Transmitters and Receivers - Classification of Radio Transmitters, AM andFM Transmitters, SSB Transmitters. Radio Receiver Types, AM Super Heterodyne Receivers, FM Receivers, Specifications of AM and FM Receivers,

Reference Books

1 Signals & Systems, Willsky, A. S., Nawab, S. H., Oppenheim, A. V.,, 2015, Pearson.

2 Modern Digital and Analog Communication Systems, Lathi, B. P., Ding, Z.,, 2010, Oxford University Press.

3 Electronic Communications System: Fundamentals Through Advanced, Tomasi, W., 5/e. 2015, Pearson Education.

4 Signals and Systems, A. Anand Kumar, 3/e 2015, PHI.

5 Analog communication systems, Sanjay Sharma, 2016 ed, Katson Books.

23EC2106R - PROCESSORS AND CONTROLLERS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2106R	PROCESSORS AND CONTROLLERS	PRC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the foundational concepts of the 8086 microprocessor, including its architecture, pinout, addressing modes, instruction set, timing diagrams for different modes, ALU programming, and practical examples."	3	PO2, PO7, PSO1
CO2	Apply the core aspects of the 8051 microcontroller, focusing on its architecture, pin diagram, addressing modes, instruction sets, and programs involving arithmetic and logical operations, as well as the use of timers and counters."	3	PO2, PO7, PSO1
CO3	Analyse the 8051 microcontroller applications through assembly-level programming, exploring interrupts, serial port operations, and peripherals like timers, seven-segment displays, LCDs, ADCs, DACs, and stepper motor control, with case studies in keypad interfacing, traffic signals, home automation, and industrial use cases."	4	PO5, PO7, PSO1
CO4	Apply the architectures and features of PIC and ARM microcontrollers, examining the ARM series\' evolution, core features, pipeline processing, processor modes and registers, exception handling, and ARM\'s Thumb mode of execution."	3	PO2, PO7, PSO1
CO5	Analyse the 8051 microcontroller applications through assembly-level programming, exploring interrupts, serial port operations, and peripherals like timers, seven-segment displays, LCDs.	4	PO5, PO7, PSO1

Syllabus

8086-Microprocessor: Basics of processor, Introduction, and History of Processors, pinout, Architecture, addressing modes, Instruction set, Timing Diagram for Minimum and Maximum mode, ALU programming, and examples.

8051-Microcontroller: Architecture, Pin Diagram, addressing modes, Instruction sets, Programs involving Arithmetic and Logical Instructions, Timers/Counters.

8051-Microcontroller Applications: Interrupts & Serial port Assembly level programming, Peripherals and Input Output with 8051 Microcontroller - Timers and Interfacing Seven Segment, LCD, ADC, DAC & Stepper Motor Control). Case studies: Keypad, Traffic signal, Home automation & Industrial applications.

PIC & ARM Microcontroller: Architecture & features of PIC, Architecture of ARM Microcontroller, ARM series of microcontrollers, Evolution of ARM microcontrollers, ARM features, Basic concepts of pipeline processing, ARM processor modes and registers, Special registers and exception handling, ARM and Thumb modes of execution.

Reference Books

1 Advanced Microprocessors and Peripherals , A K Ray and K M Bhurchandi, 2006-2nd Edition, The McGraw Companies.

2 The 8051 Micro controller and Embedded systems: using assembles and C , Mazidi & McKinley, 2007-2nd Edition, Pearson Publishers.

3 Design with PIC Microcontrollers , John B. Peatman, 1998-2nd Edition, Pearson Publishers.

4 Microprocessor and Interfacing, D.V.Hall, 2006 - 2nd Edition, Tata McGraw Hill Publishing Company.

23EC2210R - NETWORK PROTOCOLS AND SECURITY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2210R	NETWORK PROTOCOLS AND SECURITY	NPS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the knowledge of communication to understand the concepts of physical layer and datalink layer.	3	PO1, PO2, PO3, PSO2
CO2	Analyze various MAC protocols and apply IP addressing concepts to subnet a network.	4	PO2, PO3, PSO2
CO3	Analyze static and dynamic routing algorithms and transport layer protocols.	4	PO2, PO3, PSO2
CO4	Analyze application layer protocols and various cryptographic algorithms.	4	PO2, PO3, PSO2
CO5	Analyze the functionality of the network using different protocols and working of various cryptographic algorithms.	4	PO2, PO5, PSO2

Syllabus

Introduction to Computer networks and Data Link Layer: Use of Computer Networks, Network Hardware, Network software, Reference models: OSI and TCP/IP, Physical Layer: The theoretical basis for Data Communication, Guided and Unguided Transmission Media, Switching. Data Link Layer: DLL design issues. Error Detection and Correction, Elementary data link protocols, sliding window protocols.

Medium Access Control Sub layer: Channel allocation problem, multiple access protocols, Design issues of Network layer, Inter-networking Devices: Distinguishing of Networking Devices and Inter-networking Devices, VLANS, Addressing: IP addressing (IPV4 & IPV6), subnetting; IP Tunneling, NAT,PAT

ARP, DHCP Types of Routing: static, default and dynamic. Networking Protocols: RIP, OSPF, BGP; Access Control list for IPV4, IPV6, Other Protocols: Transport Layer: Process to Process Delivery; UDP; TCP; Stream Control Transmission Protocol (SCTP); Congestion Control: Open Loop, Closed Loop Choke Packets; Quality of Service: Techniques to Improve QoS: Leaky bucket algorithm, Token bucket algorithm.

Application Layer: DNS, SMTP, SNMP Introduction to Security, Security goals, Security Attacks, Security Services and Mechanisms, A Security Model, Asymmetric & Symmetric key Ciphers, Substitution Techniques, Transposition Techniques, DES, RSA algorithm, Secure Socket Layer.

Reference Books

1 Data Communication and Networking, Behrouz A. Forouzan, 5th Edition, (2012), TMH.

2 Cryptography and Network Security , William Stallings , 6th Edition, 2015 , Pearson Education.

3 Computer Networks -- A Systems Approach , Peterson, LL and Davie BS , 5th edition-(2012) , Morgan Kaufmann, Elsevier.

4 Computer Networks , A.S.Tanenbaum, David J. Weteral , 5 th edition. 2013 , Pearson Education.

5 Computer Networking: A Top-Down Approach , Kurose, J and Ross, K , 6th edition-(2012) , Addison-Wesley.

23EC2223F - FUNDAMENTALS OF ROBOTICS (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2223F	FUNDAMENTALS OF ROBOTICS	FOR	F	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the functional elements to build different types of basic robotic systems with minimal cost	3	PO1, PSO2
CO2	Apply Denavit -Hattenberg parameters to to describe the kinematic chain of manipulators	3	PO1, PSO2
CO3	Apply the differential motion through Jacobian to control the manipulator for precise movement and manipulation tasks	3	PO1, PSO2
CO4	Analyze the force control techniques using Lagrange dynamic model by understanding how forces and torques affect the motion of robotic systems.	4	PO1, PSO2
CO5	Analyze the movement of manipulator with the required kinematics to understand how the manipulator\'s joints and links contribute to its motion in Cartesian space	4	PO5, PSO2

Syllabus

Types of robots, Classification, usage, and the diverse Applications of Robots. Different Types and Ranges of Sensors Internal and External sensors. Common Sensors encoders, tachometers, strain gauge based force torque sensors, proximity, and distance measuring sensors. Different kinds of Actuators: Stepper, DC servo and AC motors.

Mathematical representation of Robots Position and orientation Homogeneous transformation Various joints Representation using the Denavit Hattenberg parameters Degrees of freedom Direct kinematics Inverse kinematics SCARA robots Solvability Solution Methods-Closed form solution.

Linear and angular velocities Manipulator Jacobian Prismatic and rotary joints Inverse Wrist and arm singularity Static analysis Force and moment Balance., Verify Stability and Equilibrium, Apply Equilibrium Equations

Lagrangian mechanics-2DOF Manipulator Lagrange Euler Formulation Dynamic model Manipulator control problem Linear control schemes PID control scheme Force control of robotic manipulator

Reference Books

1 Robotics and Control, R.K.Mittal and I. J. Nagrath, 2017, 1st Edition, Tata McGraw Hill.

2 Introduction to Robotics Mechanics and Control, John J. Craig, 2008, 2nd Edition, Pearson Education.

3 Industrial Robotics, M. P. Groover, M. Weiss, R. N. Nageland N. G. Odrej, 2010, 2nd Edition, Tata McGraw Hill.

4 Robotics-Fundamental Concepts and Analysis, Ashitava Ghoshal, 2015, 1st Edition, Oxford University Press.

5 Robotics, K. K.AppuKuttan, 2017, 2nd Edition, I K International.

23EC2224F - DEEP NETWORK ARCHITECTURES (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2224F	DEEP NETWORK ARCHITECTURES	DNA	F	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To demonstrate the fundamentals of deep learning	3	PO1, PO3, PSO3
CO2	To demonstrate and apply the Recurrent Neural Network (RNN) algorithms for classification applications using sequential datasets	3	PO1, PO3, PSO3
CO3	To Apply and analyze the performance metrics for various CNN Architectures.	3	PO1, PO3, PSO3
CO4	To analyze and implement the deep learning models using MNIST, Cifar10, and ImageNet datasets.	3	PO1, PO3, PSO3
CO5	To analyze and execute the deep learning application by developing the Python code.	4	PO1, PO2, PO3, PO4, PSO3

Syllabus

Convolutional neural networks: Convolution neural networks (CNN), building blocks of CNN, fundamentals of CNN, the architecture of CNN, Convolution and Pooling Layers, Activations in CNN, and loss functions

SGD and Adam Optimizers: performance metrics of deep learning: accuracy, precision, and recall, F1 score, ROC plots, and confusion matrix.

Recurrent neural networks: Time series modeling of data. Recurrent Neural Network (RNN), Training and testing on time series data.

RNN Types: Long short-term memory (LSTM), gated recurrent unit (GRU), and Bi-directional RNNs, Advantages, and drawbacks.Training, testing, and inferencing.

CNN Architectures: Deep Multi-layer Perceptrons, DenseNets, AlexNet, ZFNet, VGG, Inception Nets, and ResNets

Layer composition, hyperparameter computation, filter kernels, pooling, and activations. Performance measures and comparison.

Building Models: Deep Learning Model building with Keras, TensorFlow, and Scikit-learn. Built-in datasets in Tensorflow.

Describe, Apply, and Analyze the MNIST, Fashion MNIST, Cifar10, and ImageNet datasets along with AlexNet, VGG, and ResNet. Evaluate and compare the performance of AlexNet, VGG, and Resnet on the considered datasets.

Reference Books

1 Deep learning with Python, Chollet, Francois., 1, Simon and Schuster.

2 Deep learning with Python: develop deep learning models on Theano and TensorFlow using Keras, Brownlee, Jason, 2, Machine Learning Mastery,.

3 Deep learning, Trask, Andrew W., 1, Manning Publications Co.

4 Deep Learning, Trask, Andrew W., 2, LW Christina Taylor, Aleksandar Dragosavljevic, ed.

5 Deep Learning, Ian Good fellow, Yoshua Bengio, Aaron Courville,, 1, Manning Publications Co..

6 Neural Networks and Deep Learning, Michael Nielsen, 3, LW Christina Taylor,.

7 Learning Deep Architectures for AI,, Yoshua Bengio, 2, Aleksandar Dragosavljevic, ed.

23EC2235F - RESILIENT NETWORKS (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2235F	RESILIENT NETWORKS	RNW	F	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Able to learn the basics of network threats and attacks	3	PO1, PO2, PSO3
CO2	Able to identify the network security Protocols and technologies such as SSL, TLS and IP Security Architecture	3	PO2, PO3, PSO3
CO3	Employ the Network defense using Access control, Password management, Incident response, security awareness	3	PO2, PO3, PSO3
CO4	Analysis the different Secure network architectures and Hardening	4	PO2, PO3, PO5, PSO3

Syllabus

Network attacks: Common terms and their definitions: Perimeter security, Access control, Security monitoring and incident response, Security awareness and training, Regular updates and patch management, Backup and disaster recovery. Vulnerabilities, Exploit, Threat, Attack, Hacker, Malware and their types

Network security Protocols and technologies: Transport Layer security, IPsec: Overview IP Security Architecture Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management, Virtual Private Networks.

Network defense: Security policy: Acceptable use, Network security, data management, Access control, Password management, Incident response, security awareness, Risk Management, Vulnerability management: Identification, scanning, security testing, assessment, remediation, management, Incident response, security awareness, physical security

Secure network architecture and Hardening: Physical security, network segmentation, access control, data encryption, vulnerability scanning, layered approach for network security , Firewalls: types, rules, configuration and maintenance

Reference Books

1 Cryptography and Network Security - Principles and Practice , William Stallings, 2017, Pearson Education.

2 Network And Application Security Fundamentals and Practices, Atul Kahate, 2012, Mc Graw Hill.

3 Network Security Essentials: Applications and Standards, Debashis Gnaguly and Shibamouli Lahiri, 2009, Science Publishers Jersey, British Isles.

4 Network Security: Private Communication in a Public World, Charlie Kaufman, Radia Perlman, and Mike Speciner, 2002, Prentice Hall.

5 Applied Cryptography: Protocols, Algorithms, and Source Code in C, Bruce Schneier, 1996, Wiley.

23EC3112R - DISCRETE TIME SIGNAL PROCESSING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC3112R	DISCRETE TIME SIGNAL PROCESSING	DTSP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To interpret the transforms for discrete time signals.	3	PO1, PO2, PSO1
CO2	To implement Digital IIR Filters	4	PO2, PO3, PSO2
CO3	To implement Digital FIR Filters	4	PO2, PO3, PSO2
CO4	To Acquaint with Wavelets transforms and its applications.	4	PO2, PO3, PSO2
CO5	To implement various discrete signal operations and Filters	4	PO1, PO2, PO3, PO5, PSO1, PSO2

Syllabus

TIME DOMAIN AND FREQUENCY DOMAIN ANALYSIS

IIR FILTER DESIGN

FIRFILTER DESIGN

MULTIRATE SIGNAL PROCESSING CONCEPTS

Reference Books

1 Discrete-Time Signal Processing, A.V.Oppenheim, R.W. Schafer and J.R. Buck,, 8, Pearson, 2004.

2 Signal Processing for Digital Communications, G.J.Miao, 1, Artech House.

3 Introduction to Wavelets and Wavelet Transforms, C.S.Burrus, R.A.Gopinath, H.Guo, 3, Prentice hall,2003.

4 Digital Signal Processing Using MATLAB AND wavelets, Vinay K. Ingle, John G. Proakis, 2, PWS publishing.

23EE2207R - CONTROL SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE2207R	CONTROL SYSTEMS	CS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Model physical systems and control system components	3	PO1, PO5, PSO1
CO2	Analyse the control systems under time domain and stability analysis.	4	PO1, PO5, PSO1
CO3	Analyse the control systems under frequency domain analysis.	4	PO1, PO5, PSO1
CO4	Analyse the state space models of LTI systems	4	PO1, PO5, PSO1
CO5	Test the principles of control systems using software & prototype models	4	PO2, PO5, PSO2

Syllabus

Control System Concepts- Control system terminology, examples of simple control systems, open loop and closed loop control systems, Types of control systems. Mathematical models of physical systems- Analogy with mechanical systems, Formulation of differential equations for electrical systems Transfer functions of open and closed loop systems, DC & AC servomotors, block diagram representation of control systems, signal flow graph, Masons gain formula

Time domain analysis: Standard test signals -step, ramp, parabolic and impulse, impulse response, characteristic equation of feedback systems, transient response of first order and second order systems to standard test signals, time domain specifications, steady state error and error constants, Introduction to P, PI, PID controllers. Stability analysis: Concept of stability and conditions for stability, Routh - Hurwitz criterion, dominant poles of transfer function. Root Locus Technique- The root locus concept, basic properties, magnitude and angle conditions, properties, and construction of the complex root loci.

Frequency response Analysis & Design: Introduction, frequency response specifications, correlation between time and frequency response, specifications, polar (Nyquist) plot, Bode plot, phase margin and gain margin.

State space analysis: Concepts of state, state variables, state vector, input vector, output vector; development of state models for simple systems, Concepts of controllability and observability.

Reference Books

1 Control System Engineering, J Nagrath& M Gopal, 5th, New Age International.

2 Automatic Control Systems, B C KUO, 10TH, Prentice Hall India.

3 Modern Control Engineering, K Ogata, 5TH, Prentice Hall India.

4 Control Systems Principles and Design, M GOPAL, 4TH, Tata Mc-Graw Hill.

5 Programmable Logic Controllers Principles and Applications, J W Werb& Ronald A Reis, 5TH, Pearson Publications.

23EE2226F - ELECTRICAL TECHNOLOGY (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE2226F	ELECTRICAL TECHNOLOGY	ET	F	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze the Electrical circuits in the context of DC and AC voltages and currents.	4	PO1
CO2	Analyze the Three-phase AC circuits and study the various measuring instruments.	4	PO1
CO3	Apply the basic magnetic induction principles to Transformers and induction machines.	3	PO2
CO4	Apply the basic principles of electromechanical energy conversion to dc machines and Synchronous Machines.	3	PO2
CO5	Test the performance of Electrical Machines and circuits	4	PO1, PO5

Syllabus

An overview of the course : Generation, Transmission, and Distribution of Electric Power. Analysis of DC Circuits: DC Series Parallel Circuits, Voltage Divider and Current Divider Rules, star-delta transformation.Single Phase AC Circuits: R-L-C Series-parallel Circuits.

Three phase AC circuits : Three phase Star-delta connections, Three-phase Power Measurements, Measuring Instruments : Classification, deflection, controlling, damping torque, MI and MC type Ammeter, Voltmeter, Wattmeter.

Transformers: Ideal Transformer, Practical Transformer Testing, Efficiency & Regulation, Three Phase Transformer, Auto-Transformer. Three-Phase Induction Machines and Single-Phase Induction Machines: Rotating Magnetic Field in Three-phase Induction Motor Construction and Principle of Operation of IM. Starting Methods for Single-phase Induction Motor.

DC Machines: Constructional Features, Principle of Operation, EMF & Torque Equation, Losses, Efficiency and Testing of D.C. Machines. Synchronous Machines: Principle of Operation and Constructional Features of synchronous Machines, EMF Equation.

Performance of Electrical Machines and Circuits: Verification of Kirchhoff Laws, Superposition and Thevenins Theorems. Measurement of three-phase power using the two wattmeter method. Determine the voltage regulation and efficiency of single phase transformer by direct Load Test. Brake test on 3-phase induction motor. Characteristics of DC shunt generator and alternator.

Reference Books

1 Electrical Machines, I.J Nagrath& D.P Kothari, 3rd ed-2009 , Tata Mc Graw-Hill,2009 .

2 Theory of AltFundamentals of Electric Circuits, Charles K. Alexander and Matthew N. O. Sadiku, 5th edition-2013. , McGraw Hill Education..

3 Electric Machinery Fundamentals, Stephen J Chapman, Fourth Edition-2005., McGraw Hill, Singapore. .

4 Engineering Circuit Analysis, William H. Hayt Jr. and Jack E. Kemmerly, 9th edition-2020., McGraw Hill. .

23GDU3101R - PROGRAMMING FOR GAME DEVELOPMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23GDU3101R	PROGRAMMING FOR GAME DEVELOPMENT	PGD	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the concepts of Game design and development.	2	
CO2	Apply the use of mathematical and geometrical concepts in Game Programming.	3	
CO3	Apply the Core architectures of Game Programming.	3	
CO4	Analyse advance concepts in game development and explain various platforms and frameworks for Game Programming	3	
CO5	Apply above approaches in Laboratory experiments related to Games using Course with Code in Unity	3	
CO6	Analyse above approaches in Skilling experiments related to Games using Course with Code in Unity	3	

Syllabus

Introduction to Game Development , Game Engines: Game Engine Concepts, Game Development Tools, Introducing Unity. Unity Development Environment: IDE Basics, Unity Concepts, Sprites. Simple Movement and Input: Simple Movement, Simple Rotation and Scaling, Easy Input Handling in Unity. 2D Physics Concepts: Rigid body Components

Unity Colliders, Physics Materials, Scripting Collision Events, Organizing Game Objects Parent-Child Objects, Sorting Layers, Tagging Game Objects, Collision Layers, Managing Game Objects: Prefabs, Creating and Destroying Objects

Activating and Deactivating Objects, Controlling Object Life spans with Invoke, Virtual world: Moving Cameras, Setting Boundaries, Building a Tile world Mini- Maps, Sound Effects: Sound Files, Adding Sounds to Game Objects, Scripting Sounds, Game Mechanics: Storytelling and Progression, Scrolling Game Mechanics.

Animation: Simple Unity Animation, Animator States, Scripting Animations, Animations and Colliders, Advanced Game Physics: Applying Forces, Unity Physics Joints,Unity2DEffectors,User Interfaces:Unity Buttons,Other UI Controls,UI Design Concepts,Project Publishing: Splash Screens, Credit Scenes and Icons, Publishing to PC, Mac and Linux Computers, Publishing to Smartphones, Publishing to Game Consoles, Entity component system.

Reference Books

1 Game Coding Complete, Mike Mc Shaffrfy and David Graham , Fourth Edition , Cengage Learning.

2 Game Engine Architecture , Jason Gregory , Second edition , CRC Press.

3 D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics , David H. Eberly , Second edition , Morgan Kaufmann.

4 Fundamentals of Game Design , Ernest Adams and Andrew Rolling , Second edition , New Riders.

5 Mathematics for 3D Game Programming and Computer Graphics , Eric Lengyel , Third Edition , Course Technology .

23GDU3303R - AR & VR APPLICATION DEVELOPMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23GDU3303R	AR & VR APPLICATION DEVELOPMENT	AR&VR	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand and Basics of Augmented Reality and Interactions. Fundamentals of Augmented , Mixed Reality and its features.	2	
CO2	Apply Basics of Virtual Reality and Interactions. Fundamental Concept and Components of Virtual Reality	3	
CO3	Apply Graphics Pipelines, Creating a sample augmented reality apps in android	3	
CO4	Apply Apllications of Virtual Reality in Digital Entertainment	3	
CO5	Develop applications through Lab experiments	3	
CO6	Develop applications through Skill experiments	3	

Syllabus

Introduction to Augmented Reality -Augmented Reality Interactions, Monitor Based Displays, Headmounted Displays, Ar Interaction, Ar Tracking , Augmented and Mixed Reality, Technology and features of augmented reality, Typical AR Experiences, Difference between AR, VR and MR, Challenges with AR, AR systems, Simultaneously Localize and Map Environment, Optical Tracking , AR Tracking and registration , Markers , Holography and Photography, AR System Evaluation.

Introduction to Virtual Reality- Historical development of VR Fundamental Concept and Components of Virtual Reality, Architecture of Virtual Reality, Primary Features and Present Development on Virtual Reality, Typical VR System, The three l\\'s of virtual reality, commercial VR technology and the five classic components of a VR system, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement ,VR Content, Factors in Virtual Reality, Benefits of virtual reality, Typical System Delays, VR Graphics Architecture.

The Graphics Pipeline VR Panorama,Stereo Movie, Stereo Panorama , Mono Panoramas ,Comparison Mono and Stereo Panoramas, Spatial Audio for VR, Motion Sickness, Spherical Harmonics ,Engines and Unity,VR Engines,Audio ,3D Audio, Physics ,User Interface, VR Engines Content Creation,Latency,Post-rendering Warp,Eye Tracking

VR Technology in Film & TV Production.VR Technology in Physical Exercises and Games.Demonstration of Digital Entertainment by VR. 3D user interfaces - Why 3D user interfaces. Major user tasks in VE. Interaction techniques for selection, Manipulation and navigation.3DUI evaluation.

Reference Books

1 Understanding Augmented Reality: Concepts and Applications, Alan B. Craig , Second, Newnes.

2 Virtual Reality , Brett S. Martin , Second, Norwood House Press.

3 Understanding Virtua/Reality , William R. Sherman and Alan B. Craigm, Third , Morgan Kaufmann Publishers.

4 Game Coding Complete, Mike Mc Shaffrfy and David Graham, Fourth Edition, Cengage Learning.

23GDU3506 - PRINCIPLES OF GAME DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23GDU3506	PRINCIPLES OF GAME DESIGN	PRGD	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding Video Games and Design Components	2	PO1, PO2, PO3, PSO3
CO2	Discuss Game Concepts and its world	2	PO1, PO2, PO3, PSO3
CO3	Illustrate Story telling Character and user interface Design	3	PO1, PO2, PO3, PSO3
CO4	Analyze the Game Play its mechanics and balancing	4	PO1, PO2, PO3, PSO3
CO5	implement Games using Course with Code in Unity	3	PO1, PO2, PO3, PSO3

Syllabus

Video Games and Design Components: Definition of game, Conventional Versus Video Games, How video games Entertainment, Design Components and Processes: The key components of video games, The structure of video games, Stages of video games, Game design team roles, Game design documents,

The anatomy of a game designer. Game Concepts and its world: Getting an Idea, From Idea to game design concept, the player role, choosing a genre, Defining your target audience ,progression considerations, types of game machines, Introduction to game world and its purpose.

Dimensions of Game world. Story telling Character & user interface Design: Story telling play, Goals of character design, The story telling engine, Linear and non linear stories, Emotional limits and Interactive stories, Player centric interface design, Inputs devices, The design process

Game Play and its mechanics: Making game fun, Challenges, What are core mechanics, balanced game, Action Games, The level of design process, What are adventure games, Online Games, Design issues of online games, Advantages and disadvantages, Design to appeal to particular group

Reference Books

1 Fundamentals of Game Design, Earnest Adams, 3, New Riders..

2 Mastering Game Design with Unity 2021, Scott Tysoki, 2, bpb publishers.

3 Game Development 2042: The Future of Game Design, Development, and Publishing [Paperback] Fields, , TIM Fields, 1, CRC Press.

4 The Art of Game Design: A Book of Lenses, , JESSE SCHELL, Third Edition, CRC Press .

5 The Future of Game Design, Development, and Publishing [Paperback] Fields,, TIM Fields , 1, CRC Press .

23GET3101R - SOLAR PV AND MICRO ENERGY TECHNOLOGIES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23GET3101R	SOLAR PV AND MICRO ENERGY TECHNOLOGIES	SPMET	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the manufacturing of Solar cells, their working and parameters influencing the performance of the solar cells.	2	PO5, PSO1
CO2	Apply maximum power point tracking techniques to improve the performance of solar PV systems.	3	PO5, PSO1
CO3	Apply the fuel cell chemistry to build fuel cell applications and compare different types of fuel cells.	3	PO5, PSO1
CO4	Make use of heat transfer principles for energy extraction from various micro energy sources.	3	PO5, PSO1
CO5	Test the performance of solar PV and micro energy sources.	4	PO5, PSO1
CO6	Build solar based and fuel cell-based power sourcec and do required troubleshooting if any technical problem encounters.	3	PO5, PSO1

Syllabus

Solar PV energy conversion: Generic Photovoltaic Cell, Equivalent Circuits, Cells to Modules to Arrays, IV Curve, Impacts of Temperature and Insolation, Shading impacts on IV curves, MPPT, System sizing, System Performance.

Modelling of Solar PV system components: Mathematical models of PV cell, PV Array, Battery pack, grid connected and isolated modes of operation, MPPT techniques.

Fuel Cell energy conversion: PEM Fuel Cells, Solid Oxide Fuel Cells, Electrolyzers, Power Electronic Interfacing Circuits, Standalone and Grid Connected Fuel Cell Power Generation Systems, Hybrid Fuel Cell Based Energy System Case

Micro Energy Sources: Ocean Thermal energy conversion, Geo-thermal energy conversion, Tidal Energy conversion, Biomass energy, Biogas plants and Batteries.

Reference Books

1 Solar Electricity Handbook , Micheal Boxwell , 2021, Green Stream publishing .

2 Hand Book of Fuel Cells - Fundamentals and Technology and Application , Wolf Vielstich, Arnold Lamm, Hubert A. Gasteiger, 2003, Wiley & Sons .

3 Solar Energy - Fundamentals and Applications , H.P. Garg & J. Prakash , 1997, Mc Graw Hill Education. .

4 Modeling and Control of Fuel Cells: Distributed Generation Applications , M. H. Nehrir, C. Wang , 2009, Wiley-IEEE Press .

5 Non-Conventional Energy Sources , G. D. Rai , 1988, KHANNA PUBLISHERS .

23GET3202R - WIND AND ENERGY STORAGE TECHNOLOGIES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23GET3202R	WIND AND ENERGY STORAGE TECHNOLOGIES	WEST	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Interpret principles and control of Wind Energy Conversion	2	PO1, PO5
CO2	Model Solar Wind energy conversion system components	3	PO1, PO5
CO3	Model Electro-chemical energy storage components	3	PO1, PO5
CO4	Model Mechanical energy storage components	3	PO1, PO5

Syllabus

Wind Energy Conversion System: Components of WECS, Power obtained from the wind, Power Regulation, Schemes for Maximum Power Extraction, Wind Turbines & Generators: Fixed-speed Induction Generator (FSIG) based Wind Turbines, Doubly Fed Induction Generator (DFIG) based Wind Turbines, Fully Rated Converter-based (FRC) Wind Turbines.

Modelling of WECS components: Mathematical models for DFIG, PMSG, Stand alone and Grid Connected WECS system control.

Electro-chemical Energy Storage: Batteries - lead acid, lithium ion, flow, design considerations, life cycle and reliability study, Ultra-capacitors - operation, applications, Model for lead acid battery and ultra-capacitor.

Mechanical Energy Storage: Models for pumped hydro, compressed gas, flywheel storage, System cost and efficiency, Thermal storage- Materials, Design considerations, Solar thermal energy storage.

Reference Books

1 Microgrids and Active Distribution Networks, S. Chowdhury, S. P. Chowdhury, P. Crossley, 2006, IET Power Electronics Series.

2 Integration and Control of Renewable Energy in Electric Power System, Ali Keyhani Mohammad Marwali and Min Dai, 2010, John Wiley publishing company.

3 Non-Conventional Energy Sources, G. D. Rai, 1988, Khanna Publishers.

4 Energy Storage for Power Systems, JA.G. Ter-Gazarian, 1994, IET.

23GET3405M - ENERGY MANAGEMENT AND GREEN BUILDING (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23GET3405M	ENERGY MANAGEMENT AND GREEN BUILDING	EMGB	M	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply different types of energy audit for energy management in green buildings	3	PO1, PO7, PSO1
CO2	Interpret different types of energy conservation opportunities in electrical compoents used for various applications	3	PO1, PO7, PSO2
CO3	Apply different types of energy management strategies to improve energy efficiency in green buildings	3	PO1, PO7, PSO1
CO4	Apply different types of practices to get maximum life and improve energy efficiency green buildings	3	PO1, PO7, PSO1

Syllabus

Energy Audit: Need, types, methodology and approach, Instruments for energy audit, Energy Management Approach, Understanding Energy Costs, Bench marking, Energy performance, matching energy usage to requirements, maximizing system efficiency, Return of Investment

Energy conservation opportunities: Energy conservation in HVAC, Refrigeration and Air Conditioning, Pumping Systems, lighting control, lighting control, Energy Conservation Building Code, Energy Conservation opportunities in Transformers and cables, Transmission lines

Energy Management: Definition and Objective of Energy Management, General Principles, Energy Management Strategy, Energy Balance sheet and Management Information System (MIS), Energy Modeling and Optimization, Demand Side management (DSM), Peak Demand control- Methodologies

Green Building Practices: Energy efficiency-life cycle perspective, Environmental product declaration, Building information model, choice of heat insulation materials, high thermal mass materials, phase change materials, Green building certifications

Reference Books

1 Industrial Energy Management: Principles and Applications , Giovanni and Petrecca, 1999, The Kluwer international series.

2 Guide to Electric Load Management , Anthony J.Pansini, Kenneth D.Smalling, 1998, Pennwell publications.

3 Green Building: Principles and Practices in Residential Construction, Abe Kruger, Carl Seville, 2013, Cengage Learning.

4 Sustainable Construction: Green Building Design and Delivery, Charles J. Kibert, 2022, Wiley.

23IMP3101R - NATURAL LANGUAGE PROCESSING & APPLICATIONS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23IMP3101R	NATURAL LANGUAGE PROCESSING & APPLICATIONS	NLPA	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Describe the fundamental concepts in NLP and review different NLP applications.	3	PO1, PSO3
CO2	Illustrate and summarize the basic structure of NLP Pipelines.	3	PO2, PSO3
CO3	Apply and Analyze the performance of algorithms for semanticsin NLP and prioritize them for the existing applications.	3	PO1, PSO3
CO4	Apply machine learning models for finding solutions for problems in NLP and judge their performance.	4	PO2, PSO3
CO5	Design and validate NLP applications for text summarization, classification and generation through	5	PO1, PO2, PO3, PSO3
CO6	Evaluate NLP pipelines to bulid small scale applications for real time deployment.	5	PO1, PO2, PO3, PSO3

Syllabus

NLP: Overview and Motivation. Human Language from Computers Viewpoint and language building blocks. Words, text, and document models. A Chatbot NLP pipeline. Word tokenization, Building vocabulary with tokenizer and sentiment. Challenges in NLP. Approaches in NLP using NLTK and TensorFlow frameworks.

NLP Pipeline: Data Acquisition, Text Extraction and Cleanup, Pre-Processing, Feature Engineering, and Modeling

Finding meaning in word counts (semantic analysis): From word counts to topic scores, Latent semantic analysis, Singular value decomposition, Principal component analysis, Word2Vec, GloVe, Distance and similarity, Steering with feedback, Topic vector power.

Deeper learning (neural networks): Semantic queries and analogies, Word vectors, Learning meaning, Convolutional neural nets, RNNs, LSTMs, and Language Models for Text processing. Sequence-to-sequence models and attention in transformer-based Large Language models. Text Classification, summarization, Application pipeline building.

Reference Books

1. Practical Natural Language Processing, Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana , 2020, O'Reilly Media, Inc. ISBN: 9781492054054 .
2. Natural Language Processing in Action , Hobson Lane, Cole Howard, Hannes Hapke , 2019, Manning Publications. ISBN: 978161729463 .
3. Neural Network Methods in Natural Language Processing, Yoav Goldberg, 2017, Morgan & Claypool Publishers.
4. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, and Edward Loper, 2022, O'Reilly Media.

23ME1001R - ENGINEERING MECHANICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME1001R	ENGINEERING MECHANICS	EM	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the concept of forces, governing static equations, and analyze the planar system of forces.	3	PO2
CO2	Use analytical techniques for analyzing forces in statically determinate structures.	3	PO3
CO3	Apply the concepts of planar and non-planar system of parallel forces and estimate the moment of inertia for lamina and material bodies.	3	PO4
CO4	Apply fundamental concepts of kinematics and kinetics of particles to solve simple practical problems.	3	PO4

Syllabus

TWO DIMENSIONAL FORCE SYSTEMS Introduction, Basic concepts, Laws of motion, Principle of Transmissibility of forces, Resultant of a force system, force laws, Resultant of two dimensional concurrent and Non Concurrent Force systems, Free body diagrams, Applications. Equilibrium of Rigid bodies Equilibrium and Equations of Equilibrium, Lamis theorem, Type of supports and their reactions, Moments and couples, Varignons theorem, Resultant moment and applications.

SPATIAL FORCE SYSTEM & TRUSSES Spatial force systems Forces in space, resultant and equilibrium of spatial force system. Truss Analysis Trusses Assumptions involved in the Method of joints and sections.

FRICTION AND PROPERTIES OF AREAS: Friction Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry friction, Applications ladder friction, wedge friction. CENTRIOD AND MOMENT OF INERTIA Centroid, Centre of gravity, Moment of inertia Area and Mass polar moment of inertia, Parallel axis theorem.

KINEMATICS OF RIGID BODY Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational motion.Virtual Work Introduction Principle of virtual work Equilibrium of ideal systems. KINETICS OF RIGID BODY Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, DAlemberts Principles and Dynamic Equilibrium.

Reference Books

1 Engineering Mechanics Statics and Dynamics, A K Tayal, 2011, Umesh publications.

2 Engineering Mechanics Statics and Dynamics, R C Hibbeler, 2020, Pearson.

3 Engineering Mechanics , Irving H. Shames, 2016, Prentice-Hall..

4 Vector Mechanics for Engineers (in SI units) Statics & Dynamics, F. P. Beer and E.R. Johnston, 2001, Mc Graw Hill Publications..

5 Engineering Mechanics (Statics) , J L Meriam and L G Kraige, 2018, Wiley student edition..

23ME2222F - INDUSTRIAL INTERNET OF THINGS (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME2222F	INDUSTRIAL INTERNET OF THINGS	IIOT	F	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the evolution and impact of Industry 4.0, including its globalization aspects, from the first to the fourth industrial revolution	2	PO2, PSO1, PSO3
CO2	Apply core components, benefits, challenges, and applications of Industrial IIoT, including sensing, actuation, processing, networking, and security within industrial environments	3	PO2, PSO2
CO3	Apply Big Data analytics, Software Defined Networks, and fog computing techniques in Industrial IIoT for enhanced computing and security solutions	3	PO5
CO4	Apply diverse applications of Industrial IIoT, integrating Big Data analytics, Software Defined Networks, and fog computing for comprehensive industrial solutions	3	PO5
CO5	Conduct hands-on lab experiments integrating Industry 4.0, IIoT principles, sensing, actuation, Big Data analytics, SDN, and security protocols.	5	

Syllabus

Industry 4.0- Globalization: From the first to the fourth industrial revolution, LEAN Production Systems Principles and objectives of LEAN production, Implementation of LEAN practices in Industry 4.0, Benefits and challenges of LEAN systems in the digital age, Sensing & actuation, Communication, Networking types.Cyber Physical Systems and Next Generation Sensors: Collaborative Platform and Product Lifecycle Management.

Basics of Industrial IIOT: focusing on its core components, benefits, challenges, and applications within industrial environments., Industrial Processes Industrial Sensing & Actuation, Industrial IIOT: Business Model and Reference Architecture, Industrial IIOT- Layers: IIIOT Sensing-Part I, Part II, IIIOT Processing, IIIOT Networking, communication protocols, network architectures, and security considerations

Industrial IIOT Computing: Big Data Analytics and Software Defined Networks, Definition and importance of Big Data, Characteristics of Big Data: Volume, Variety, Velocity, and Veracity, Big Data processing frameworks: Hadoop, Spark, and others, Data Center Networks, Industrial IIOT: Security and Fog Computing - Fog Computing in IIIOT, Security in

Industrial IIOT Application Domains: Healthcare, Power Systems, Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies, Case studies of smart factories, Case studies on smart energy systems, Case studies on logistics and transportation efficiency, Key components and technologies driving IIoT applications,

Reference Books

1 Industry 4.0: The Industrial Internet of Things, Alasdair Gilchrist, 1st; 2016, CRC press.

2 Introduction to Industrial Automation, Stamatios Manesis George Nikolakopoulos, 2nd; 2021, CRC press T&F.

3 Industry 4.0: Managing The Digital Transformation, Alp Ustundag, Emre Cevikcan, 1st; 2017, Springer.

4 The Industrial Internet of Things: Concept, Solutions, and Applications, Anand Iyer, 1st; 2017, Wiley.

5 Industrial IoT (IIoT): Concepts and Applications, Ismail Butun (Editor), 1st;2021, Springer.

23MRAC01M - AI FOR BUSINESS STRATEGY (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAC01M	AI FOR BUSINESS STRATEGY	ABS	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the historical development of AI and its impact on various industries.	3	PO2
CO2	Apply machine learning algorithms for supervised, unsupervised, and reinforcement learning tasks.	3	PO2
CO3	Analyse the suitability of different AI frameworks and tools for specific business applications.	4	PO6
CO4	Analyse the future trends and opportunities in AI and formulate corresponding business strategies	4	PO6

Syllabus

Overview of AI and Its Applications: Definition and scope of AI, Historical context and milestones, AI applications in various industries Understanding Business Strategy: Basics of business strategy, Strategic planning frameworks, Importance of aligning AI with business objectives AI Strategy Development: Formulating an AI strategy, Identifying business opportunities with AI, Case studies of successful AI-driven business strategies Ethical and Regulatory Considerations: Ethical implications of AI in business, Regulatory frameworks and compliance. Addressing bias and fairness in AI algorithms

Foundations of Artificial Intelligence: Machine Learning Fundamentals: Introduction to machine learning, Supervised, unsupervised, and reinforcement learning, Feature engineering and model evaluation Deep Learning Basics: Neural networks and deep learning concepts, Convolutional Neural Networks (CNNs) for image recognition, Recurrent Neural Networks (RNNs) for sequence data

AI Technologies and Tools for Business: Practical AI Tools: Introduction to popular AI frameworks (TensorFlow, PyTorch), Hands-on experience with AI development platforms (Google AI Platform, Azure ML) Natural Language Processing (NLP) in Business, Introduction to NLP and its applications, Sentiment analysis, text summarization, and language translation,Case studies of NLP in business contexts

AI Implementation and Impact on Business Strategy: AI Implementation Challenges:Challenges in deploying AI solutions in business, Integration with existing systems and workflows, Change management and organizational readiness AI Business Strategy in Practice:Real-world examples of AI-driven business transformations, Strategic decision-making with AI insights, Future trends and opportunities in AI and business strategy

Reference Books

1 Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig , 2021, Pearson.

2 Competing in the Age of AI, Marco Iansiti and Karim R. Lakhani, 2020, Harvard Business Review Press.

3 Deep Learning, Ian Goodfellow, Yoshua Bengio, and Aaron Courville, 2017, MIT Press.

4 Decision Intelligence Analtyics, P. Mary Jeyanthi,Tanupriya Choudhury, 2022, Springer.

23MRAC02M - AI STRATEGY AND GOVERNANCE (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAC02M	AI STRATEGY AND GOVERNANCE	ASG	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand and articulate the key concepts and components of AI strategy within engineering organizations.	2	PO5
CO2	Understand and analyse AI governance frameworks and policies, considering ethical, legal, and societal implications	2	PO6
CO3	Apply risk management strategies for AI projects, identifying potential risks and mitigation approaches	3	PO7
CO4	Formulate and implement AI strategies that align with organizational goals and regulatory requirements	4	PO8, PSO2, PSO3

Syllabus

Foundations of AI Strategy and Governance: Introduction to AI Strategy and Governance, Overview of AI in engineering, Importance of AI strategy,Key governance issues in AI. AI Strategy Fundamentals: Defining AI strategy, Components of a successful AI strategy, Case studies of AI strategy in engineering. AI Governance Frameworks: Overview of AI governance, Regulatory and compliance aspects, International standards and best practices

Ethical and Societal Considerations: Ethical Considerations in AI: Ethical implications of AI, Bias and fairness in AI, Privacy and data protection. Legal and Societal Implications of AI: Legal frameworks for AI, Societal impacts of AI, Role of public policy in AI governance.AI Risk Management: Identifying risks in AI projects, Risk assessment methodologies, Developing risk mitigation strategies.

AI Strategy Implementation: AI in Organizational Strategy: Integrating AI with business strategy, AI-driven innovation and competitive advantage, Strategic planning for AI implementation. Case Studies and Applications: Real-world applications of AI in engineering, Success stories and lessons learned, Group discussions and presentations.AI Policy Development: Crafting AI policies, Policy implementation and monitoring, Role of stakeholders in policy development

Advanced Topics and Future Trends: AI Governance in Practice: Best practices for AI governance, Tools and technologies for governance, Continuous improvement in AI governance. Future Trends in AI Strategy and Governance: Emerging trends and technologies, Future challenges and opportunities, Preparing for the future of AI. Course Review and Final Project Presentations: Review of key concepts, Final project presentations, Course wrap-up and feedback

Reference Books

1 Artificial Intelligence: A Guide for Thinking Humans, Melanie Mitchell, 1st Edition, 2019, Farrar, Straus and

2 The Ethics of Artificial Intelligence, Nick Bostrom and Eliezer Yudkowsky, 1st Edition, 2014, Cambridge University Press.

3 AI Superpowers: China, Silicon Valley, and the New World Order, Kai-Fu Lee, 1st Edition, 2018, Houghton Mifflin Harcourt.

4 HBR Guide to AI Basics for Managers, Eric SiegelEric Siegel, 2023, Harvard Business Review Press.

23MRAC03M - SUCCESSFUL AI STRATEGIES : A CEO'S PERSPECTIVES (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAC03M	SUCCESSFUL AI STRATEGIES : A CEO'S PERSPECTIVES	SAI	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the strategic importance of AI in business leadership.Learn to articulate a clear AI vision and foster an AI-centric culture within an organization	2	
CO2	Analyze the skills to align AI initiatives with business objectives and build cross-functional teams. Gain insights into creating and implementing robust data strategies	3	PO1
CO3	Understanding the knowledge of the technological infrastructure required for scalable AI solutions. Understand the ethical considerations and social responsibilities associated with AI	2	PO6
CO4	Analyze the ability to measure and improve the performance of AI initiatives. Learn to plan and execute scalable AI strategies for global expansion	3	PO4

Syllabus

Introduction to AI in Business Overview of AI and its Impact on Industries AI Trends and Future Prospects Workshop: Identifying AI Opportunities in Various Sectors Vision and Leadership Articulating Fostering an AICreating an AI Vision Statement for a Business -Centric Culture a Clear AI Vision

Strategic Integration Aligning AI with Business Objectives Building Cross-Functional AI Teams Successful AI Integration Case Studies Proposing AI Projects Aligned with Business Strategies Data Strategy Data Collection and Quality Data Governance and Security Designing a Data Strategy for AI Implementation

Technology and Infrastructure Scalable AI Infrastructure Emerging AI Technologies Insights from Leading Tech Companies Developing an AI Infrastructure Plan

Ethical AI and Social Responsibility Ethical Considerations in AI AI for Social Good Creating an Ethical AI Policy for an Organization Performance Measurement and Scalability Key Performance Indicators for AI Planning for Scalability and Global Expansion Presenting AI Strategies and Implementation Plans

Reference Books

1 "Artificial Intelligence: A Guide for Thinking Humans", Melanie Mitchell, 1 1984, Amazon Books.

2 "Artificial Intelligence: A Guide for Thinking Humans", Ajay Agrawal, Joshua Gans, and Avi Goldfarb, 1 2001, Taylor and Fransis.

3 "Human + Machine: Reimagining Work in the Age of AI", by Paul R. Daugherty and H. James Wilson, 1 2012, Amazon Books.

4 "Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World", Marco Iansiti and Karim R. Lakhani, 1 2008, Harvard Business School.

5 AI Superpowers: China, Silicon Valley, and the New World Order, Kai-Fu Lee, 1 2010, Amazon Books.

23MRAC04M - CRAFTING A COMPETITIVE ADVANTAGE (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAC04M	CRAFTING A COMPETITIVE ADVANTAGE	CCA	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts of competitive advantage.	2	PO1
CO2	Understand the role of innovation, differentiation, and cost leadership in competitive environment.	2	PO3
CO3	Apply the concept of competitive environment and market dynamics for decision making.	3	PO5
CO4	Apply the strategic initiatives to create and sustain competitive advantage for organisations.	3	PO5

Syllabus

Introduction to Competitive Advantage: Definition and Importance of Competitive Advantage, Historical Perspectives, Core Concepts: Value Creation, Value Capture Industry Analysis and Competitive Forces: Porter\'s Five Forces Framework Industry Structure and Profitability

Internal Analysis and Resource-Based View: Resource-Based View (RBV) of the Firm, Core Competencies and Capabilities, VRIO Framework (Value, Rarity, Imitability, Organization) Strategy Formulation: Cost Leadership and Differentiation Cost Leadership Strategy Differentiation Strategy Focus Strategy

Innovation and Disruption:Role of Innovation in Competitive Advantage, Disruptive Innovation Theory, Blue Ocean Strategy Sustaining Competitive Advantage: Barriers to Imitation, Dynamic Capabilities, Continuous Improvement

Strategic Alliances and Partnerships: Role of Strategic Alliances in Competitive Advantage, Types of Alliances: Joint Ventures, Partnerships, Mergers Global Strategies for Competitive Advantage:Globalization and Competitive Advantage Multinational vs. Global Strategies Cross-Cultural Considerations

Reference Books

1 Competitive Advantage: Creating and Sustaining Superior Performance, Porter, M. E. , 1985, Free Press.

2 Firm Resources and Sustained Competitive Advantage, Jay B. Barney, 1991, Journal of Management, Sage Publications.

3 Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant, W. Chan Kim and Ren?e Mauborgne, 2015, Harvard Business Review Press.

4 Essentials of Strategic Management: The Quest for Competitive Advantage, John E. Gamble, Arthur A. Thompson Jr., and Margaret A. Peteraf, 2018, McGraw-Hill Education.

23MRAG01 - INTRODUCTION TO GAME MATH (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAG01	INTRODUCTION TO GAME MATH	IGM	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the solid foundations of basic arithmetic, algebra, geometry, and trigonometry, essential for implementing game mechanics and algorithms.	1	PO1, PO4
CO2	Explore the principles of coordinate geometry, trigonometry, and vectors to solve complex problems in mathematical and practical contexts, demonstrating a deep understanding of the underlying concepts.	2	PO2
CO3	Apply mathematical concepts such as vectors, matrices, and quaternions to solve practical problems in 2D and 3D game development, including transformations, rotations, and collision detection.	3	PO1, PO3, PO4
CO4	Analyze to integrate mathematical knowledge with game design and development, creating functional game mechanics, realistic physics simulations, and efficient algorithms for AI and procedural generation.	4	PO2

Syllabus

Introduction to the course and its objectives, Overview of game development and the role of mathematics, Basic arithmetic operations, Order of operations (PEMDAS/BODMAS), Basic Algebra, Variables and constantsSolving linear equations, Functions and their graphs, Geometry Fundamentals, Points, lines, and angles, Basic 2D and 3D shapes, Perimeter, area, and volume.

Coordinate Geometry, Cartesian coordinate system, 1D,2D,3D, Left hand and right hand coordinate system, Left and Right hand rotation rule, Plotting points and lines, Distance formula and midpoint formula, Introduction to Trigonometry, Understanding sine, cosine, and tangent, Right triangle relationships, Basic trigonometric identities, Vectors in 2D, Definition and properties of vectors, Vector addition, subtraction, Dot product and applications.

Linear Algebra Basics, Introduction to matrices, Matrix operations (addition, subtraction, multiplication), Transformations: Translation, rotation, scaling, Advanced Trigonometry, Trigonometric functions and their graphs, Inverse trigonometric functions, , Solving trigonometric equation.s

Analyze to introduce Quaternions, Understanding quaternions and their advantages, Basic quaternion arithmetic, Using quaternions for 3D rotations, Probability and Randomness, Basic probability theory, Random number generation, Probability distributions, Graph Theory Basics, Graphs and networks, , Pathfinding algorithms (introduction to A*), State machines and their uses in AI.

Reference Books

1 Essential Mathematics for Games and Interactive Applications , James M. Van Verth , Lars M. Bishop , 3rd edition , A K Peters/CRC Press .

2 Computer Graphics: Principles and Practice , ohn Hughes , Andries van Dam, Morgan McGuire , David Sklar , James Foley, Steven Feiner , Kurt Akeley, 3rd edition , Addison-Wesley Professional .

3 3D Math Primer for Graphics and Game Development , Fletcher Dunn , 2nd edition , A K Peters/CRC Press .

4 Mathematics for 3D Game Programming and Computer Graphics , Eric Lengyel , 3rd edition , Cengage Learning, Inc .

23MRAG02 - DRAWING BASICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAG02	DRAWING BASICS	DBS	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction of drawing concepts & utilities	2	PO1
CO2	The necessity of drawing to compositing new ideas in a practical way with proper examples	2	PO2
CO3	The techniques of drawing for various purposes and planning of compositions and its expressions.From anatomy to contemporary contours students must to learn the varioations and its utilities	3	PO3

Syllabus

Cultural Drawing: Different civilizations approach withdrawing from Cave paintings, medieval art, and design, Folk art, traditional arts, pre, and postindependence art, and contemporary art practice. Transformation Drawing: Process of converting an idea

Animation & game Oriented Drawing:Caricature,Character Design,Still and motion drawings ,story board preparation-content oriented script based. Aero Dynamic Drawing:Product Design oriented and Auto mobile Dynamic Design operation according to science principles

Environment composition preparation with drawings suitable for various fileds

Reference Books

1 Heads, Features and Faces (Dover Anatomy for Artists, George B Bridgman, 5 February 2016 , Echo Point Books & Media; Reprint ed..

2 Drawing: A Complete Guide (Art of Drawing, Giovanni Civardi, 10 March 2010, Search Press; Illustrated.

3 The Big Book of Realistic Drawing Secrets: Easy Techniques for drawing people, animals, flowers , Carrie Stuart Parks , 16 May 2009, North Light Books .

4 History of ART , H.W.Jonson , January 1, 1962, Thames Hudson.

23MRAG03 - GRAPHIC DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAG03	GRAPHIC DESIGN	GDS	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the different Design techniques and their relative advantages of logo design, Stationery design, Marketing Collateral designs, of different applications.	2	PO1
CO2	Understand Design basics principles and advanced techniques in Graphic design for present different industry needs	2	PO2
CO3	Apply different Design techniques and their relative advantages of Creating 3-D Packages in Illustrator and Photoshop, Editing photographs for use in for projects, of different applications.	3	PO3

Syllabus

Graphic Design interaction of text and image, Typography and images to design magazine layouts, Fundamental components of graphic communication,

Graphic design independent and creative solutions to a series problems

Exposure to contemporary design issue, History of Graphic design , design process, creative brainstorming, conceptualizing, critical thinking, collaboration, and presentation, Print stage using Adobe Photoshop.

Reference Books

1 The Graphic Design Bible: The definitive guide to contemporary design, Theo Inglis , 28 September 2023, Ilex Press.

2 Digital Creative'S Survival Guide: Everything You Need for a Successful Career in Web, App, Multimedia and Broadcast Design H, Paul Wyatt , 31 May 2013, HOW Books.

3 The History of Graphic Design, Julius Wiedemann , 29 March 2022, Taschen America .

4 Design Basics, Stephen penthak, 1 January 2017, Wadsworth Pub Co.

5 Inspirations for Graphic Design from India, Jaya Jaitly & Dimple Bahl, 5 November 2023, Arthshila Trust.

6 Logo Modernism , Jens Muller, 26 October 2022, Taschen GmbH.

23MRAG04 - CONCEPTS OF 3D (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAG04	CONCEPTS OF 3D	C3D	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand about 3D interface environment and its functioning	1	PO1
CO2	Explore the basics of 3d interface and 3d environment design	2	PO2, PO4
CO3	Apply basic level 3d interface and its tools for design	3	PO1, PO3
CO4	Analyze basic level 3d interface and its tools for design and Animation	4	PO2, PO4

Syllabus

Introduction about the 3D environment, Installing Maya, Introduction about the Maya user interface

Understand the Maya 3D scene,Components and attributes Introduction to Modeling using 2D reference images, for making a polygon models

Applying 3D procedural texture nodes, and apply Textures using Adobe Photoshop Introduction to Lighting, the concepts of Scene and Mood of the scene like Day & Night

Analyze basics of joints and types of IK Handles, skinning & types fitting skeletons to a mesh. Generating Basic character Animation as referred in Atodesk Maya.

Reference Books

1 Introducing Autodesk Maya , Dariush Derakhshani, 1st Edition 2015, Sybex.

2 Autodesk Maya 2020 Basics Guide, Kelly Murdock, 1st Edition, SDC Publications.

3 Mastering Autodesk Maya 2016, Todd Palamar, 1st Edition, Sybex.

4 Maya Professional Tips and Techniques, Lee Lanier, 1st Edition, Sybex.

23MRBA01M - ORGANIZATIONAL BEHAVIOUR (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBA01M	ORGANIZATIONAL BEHAVIOUR	OBR	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To demonstrate the applicability of organizational behaviorconcepts to understand the individual behavior in the organization	2	PO9, PSO2
CO2	To analyze the complexitiesassociated with management of individual behavior in the organization.	4	PO9, PSO2
CO3	To analyze the complexities associated with management of groupbehavior in the organization	4	PO9, PO10, PSO2, PSO3
CO4	To analyze the facets of organizational culture and manageorganizational change and work stress	4	PO9, PO10, PSO2, PSO3

Syllabus

Organizational Behavior Nature and Significance of OB Contributing Disciplines to the OB field Challenges and Opportunities for OB Developing an OB Model, Personality Determinants of personality, The Big Five Model, Major personality attributes influencing OB Emotions Emotions and Moods, Emotional Labour Emotional Intelligence, Values Types of Values, Attitudes Types of Attitudes, work related attitudes

Learning Theories of learning Learning and OB, Perception Perceptual process Perceptual errors, Improving perception, Motivation Hierarchy of Needs Theory, Two-FactorTheory Expectancy theory, Applications of Motivation

Foundations of Group Behavior: Groups Types of groups Stages of Group Development Groups and Teams, Communication Communication Process Directions of Communication, Barriers to Effective Communication, Leadership Styles Theories of Leadership Trait, Behavioral and Contingency theories, Power & Politics Bases of Power, Organizationalpolitics, Conflict The Conflict process Managing conflict

Organizational Culture: Functions, creating and sustaining organizational culture, Organizational Change, Forces for change Resistance to change Approaches to Managing Organizational Change, Organization Development Techniques, Work Stress Causes and Consequences of Stress, Stress Management Techniques

Reference Books

1 Organizational Behavior, Robbins, Stephen, P., Timothy A Judge & Niharika Vohra, 14, Pearson.

2 Organizational Behavior:An Evidence Based Approach, Fred Luthans, 12, Mc.Graw Hill,.

3 Organizational Behavior, Aswathappa, 3, Himalaya.

4 Organizational Behavior: A Skill-Building Approach, Christopher P. Neck, Jeffery D. Houghton, and Emma L. Murray, 2, Sage.

23MRBA02M - MARKETING MANAGEMENT (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBA02M	MARKETING MANAGEMENT	MMG	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the key terms, definitions, and concepts used in the study of Marketing Management and understand the changing Marketing Environment	2	
CO2	Apply the knowledge of Segmentation, Targeting and Positioning to strategize the marketing program regarding product and PLC	3	
CO3	Apply the knowledge of marketing program regarding Pricing, Distribution channel and Physical Distribution	3	
CO4	Analyze the need for Promotion methods, ethics in marketing and the importance of social and green marketing	4	

Syllabus

Introduction Need Want and Demand Marketing Definition Concepts Significance and functions of Marketing Consumer Behaviour Nature Scope Significance and Determinants Organizational Buying Behaviour. Marketing Environment-Internal and External forces of Marketing Environment Marketing Research Marketing research process.

Market Segmentation Targeting and Positioning Strategies. Marketing Mix 4 Ps of Marketing Product Concept of Product Product Planning and New Product Development Product life cycle Branding Packing and labelling

Price Meaning Importance Objectives Factors affecting pricing Pricing policies Methods of pricing Distribution channel and physical distribution Distribution channels concepts and types of distribution channel Channel conflict Retailer and Wholesaler Physical Distribution of goods Transportation Warehousing.

Promotion Methods of Promotion Advertising Media their merits and limitations Personal selling and sales force management Sales Promotion and publicity. Marketing organization Marketing control Ethics in Marketing Social Marketing Green marketing Online Marketing

Reference Books

1 Marketing Management, Phillip Kotler and Kevin keller, 15,2017, Pearson Education.

2 Marketing: Concepts and Cases, Etzel, walker Stanton and Pandit, 14th, 2018, TMH.

3 Marketing Management Planning Implementation and Control, Rama Swamy and NamaKumari, 5th, 2020, McMillian.

4 Upstream Marketing: Unlock Growth Using the Combined Principles of Insight, Identity, and Innovation, Tim Koelzer and Kristin Kurth, 2th, 2019, Upstream.

23MRBA03M - FINANCIAL MANAGEMENT (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBA03M	FINANCIAL MANAGEMENT	FMG	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To enable the students understand the Finance Functions and types of Business	2	
CO2	To evaluate the long term and short term investment decisions	3	
CO3	To understand the working capital requirements in a company	3	
CO4	To learn different Capital Structure and dividend policies in Practice	3	

Syllabus

Introduction to Financial Management: Financial Management, Definitions, Investment Decision, Finance Decision, Dividend Decision, Objective of Financial Management, Shareholders Wealth Maximisation. Types of Business, Proprietary company, Partnership Company, Company, Features, Merits and Demerits, Private Limited Company Vs. Public Limited Company, Classification of companies, Franchisee, Cooperative Society

Capital Budgeting and Cost of Capital Meaning, Features, Techniques of Capital Budgeting, Traditional methods- Payback Period, ARR and Modern Methods- NPV, IRR & Profitability Index, Case studies on Capital Budgeting. Sources of Finance: Short term sources_ Cash credit limit, Overdraft, Bill Discounting, Short term loans, Long term sources: Equity, Preference, Bond/ Debenture, Term loans, Venture capital financing. Calculation of Weighted Average Cost of Capital and Specific Cost of Capital

Working Capital Management Gross working capital, Net working Capital, operating cycle, Determinants of Working Capital, Computation of working capital Requirement, Case studies Cash Management, Receivables and Inventory Mgt.

Capital Structure and Dividend Operating Leverage, Financial Leverage, Combined Leverage, EBIT EPS Analysis, Capital structure Theories, NI, NOI, Traditional Theory, MM Hypothesis. Dividends, Meaning, Types of Dividend, Dividend Policies in Practice, Walter, Gordon and MM Hypothesis, EBIT EPS case study

Reference Books

1 Fundamentals of Financial Management, Prasanna Chandra, 21, TMH.

2 Fundamentals of Financial Management, Jonathan Berk, Peter Demarzo, 10, pearson.

3 Fundamentals of Financial Management, Prasanna Chandra, 9, TMH.

4 Fundamentals of Financial Management, I.M.Pandey, 12, vikas publication.

23MRBA04M - HUMAN RESOURCE MANAGEMENT (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBA04M	HUMAN RESOURCE MANAGEMENT	HRM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basics of HRM and integrated perspective on role of HRM in modern business.	2	PO5, PSO3
CO2	Understand the planning of human resources and gain competency to recruit employees.	2	PO6
CO3	Apply the skills on training and appraising the performance of employees.	3	PO7
CO4	Apply the knowledge on compensation and salary administration and handling employee issues.	3	PO7

Syllabus

Introduction: Meaning and Definition, Importance of HRM, Functions of HRM, Nature & Scope of HRM, Objectives of HRM, Challenges of Human Resource Management; Personnel management vs Human Resource Management.

Manpower planning: objectives, importance, process; Job Analysis: Job Description, Job specification, uses of job analysis; Job design: Techniques of Job design; Employee Recruitment: sources of recruitment, methods of recruitment; Selection: process of selection, Types of interviews, Interview Tests; Placement and Induction, Transfer, Promotion and Separation

Training and Development: Training vs Development, methods of training: on-the job and off- the job methods; Performance Appraisal: process of performance appraisal, methods of appraisal, Errors in appraisal, Job evaluation: Methods of job evaluation; Employee Compensation: Objectives of compensation, Components of compensation; Employee Benefits, Employee Welfare and Safety.

Employee Grievances, Employee Discipline, Industrial Relations, Trade Unionism, Collective Bargaining, Managing Ethical issues in HRM, HR audit and Evaluation, International HRM, eHRM, HRIS, Recent trends in HRM: Managing Diversity, Downsizing, Contingent workforce, Tele commuting, Competency Mapping, Talent

Reference Books

1 Human Resource Management, Gary Dessler, 2019, Pearson Education.

2 Human Resource Management, Raymond Andrew Noe, John R. Hollenbeck, Barry Gerhart, Patrick M Wright, 2014, The McGraw Hill Pub.

3 Managing Human Resources, Louis &Gomitz Mejia, 2010, Pearson Education.

4 Human resource management Text and cases, Aswathappa K, 2020, Tata McGraw Hill Pub.

23MRBI01 - BIOINFORMATICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBI01	BIOINFORMATICS	BI	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Acquire the theoretical basis of bioinformatics and understand the access and analyze the biological information from databases.	3	PO1, PSO1
CO2	Choose the DNA/Protein sequences using standalone PC programs and with the help of the worldwide web.	3	PO1, PO5, PSO1
CO3	Apply multiple sequence alignment tools on gene and protein sequences to find homologs, construct and interpret the evolutionary trees.	3	PO1, PO5, PSO1
CO4	Apply structural bioinformatis to understand the secondary and tertiary structures of proteins from primary sequence.	3	PO1, PSO1
CO5	Choose the sequences from the databases and apply sequence alignment, tree construction tools to infer their relations	3	PO1, PO5, PSO1

Syllabus

Biological Information on the web. Introduction to Biological databases Primary Databases: NCBL, EMBL, DDBJ. Secondary Databases: SwissProt, PIR. Specialized data bases KEGG and BRENDA. Information retrieval from Databases. Concepts of Data mining, Basics of Sequencing Technologies, Genome projects human genome project

SEQUENCE COMPARISONS AND ALIGNMENTS: String similarity Local, Global alignment; pair wise alignments Dot plots, Dynamic Programming Methods, Heuristic methods FASTA and BLAST; Amino acid substitution matrices- PAM and BLOSUM

MULTIPLE SEQUENCE ALIGNMENT: Methods for Multiple sequence alignments- local and global multiple sequence alignment; Significance and applications of MSA, PHYLOGENETIC ANALYSIS: Origins of Molecular Phylogenetics; Methods of Phylogenetic analysis- Maximum Parsimony Maximum Likelihood and Distance based methods.

STRUCTURAL BIOINFORMATICS: Protein Structure Basics; Peptide Formation; Dihedral Angles; Hierarchy Secondary Structures, Tertiary Structures, Primary structural analysis and prediction, Secondary structural analysis and prediction.PERL programming basics

Reference Books

1 Essential Bioinformatics, Jin Xiong, 2012, Cambridge University Press.

2 BIOINFORMATICS: METHODS AND APPLICATIONS GENOMICS, PROTEOMICS AND DRUG DISCOVERY, RASTOGI, S.C., RASTOGI, PARAG, MENDIRATTA, NAMITA, 2022, PHI Learning Pvt. Ltd.

3 BIOINFORMATICS, Vinay Sharma, Ashok Munjal, Ashish Shanker, 2019, Rastogi Publications.

4 Bioinformatics: Sequence, Structure, and Databanks: A Practical Approach, Des Higgins, Willie Taylor, 2000, Oxford University Press.

23MRBI02 - BIOSTATISTICS AND DATA ANALYSIS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBI02	BIOSTATISTICS AND DATA ANALYSIS	BDA	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand a variety of statistical methods to analyze and interpret biological and health-related data	2	PO1
CO2	Demonstrate competence in using statistical software to conduct data manipulation, visualization, and hypothesis testing	3	PO1
CO3	Critically evaluate research studies in biostatistics, identifying appropriate study designs, statistical methods, and potential biases	3	PO2, PO4, PO6
CO4	Effectively communicate statistical findings through written reports and oral presentations to diverse audiences	3	PO2, PO4, PO6
CO5	Develop a robust understanding of ethical considerations in biostatistical research and data analysis practices	3	PO4, PO6

Syllabus

Introduction to Biostatistics: Role in biological and health sciences, key terminology. Types of Data: Categorical vs. Continuous data, data collection methods. Descriptive Statistics: Measures of central tendency, dispersion, and graphical representation. Probability Distributions: Binomial, Poisson, Normal distributions and their applications in biostatistics.

Sampling Distributions: Central Limit Theorem and its implications. Estimation: Confidence intervals for population parameters (means, proportions). Hypothesis Testing: Null and alternative hypotheses, types of errors, p-values. Parametric vs. Non-parametric tests: Selection criteria and practical applications in biostatistics.

Simple Linear Regression: Model assumptions, interpretation of coefficients. Multiple Linear Regression: Model building strategies, assessing model fit. Analysis of Variance (ANOVA): One-way and two-way ANOVA, post-hoc tests. Experimental Design: Principles of experimental design, randomized controlled trials, factorial designs.

Logistic Regression: Modeling binary and categorical outcomes. Survival Analysis: Kaplan-Meier estimator, Cox proportional hazards model. Meta-Analysis: Techniques for combining results from multiple studies. Ethical Considerations: Responsible conduct of research, data integrity, and privacy issues in biostatistical research.

Reference Books

1 The Analysis of Biological Data , Whitlock, Michael C.; Schluter, Dolph, 2014, Freeman, W. H. & Company.

2 Machine Learning Approaches to Bioinformatics, Yang, Zheng R, 2010, World Scientific.

3 Statistical Modeling and Machine Learning for Molecular Biology, Moses, Alan, 2016, Chapman and Hall/CRC.

4 A Primer in Biological Data Analysis and Visualization Using R, Hartvigsen, Gregg, 2014, Columbia University Press.

23MRBI03 - HEALTH INFORMATION SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBI03	HEALTH INFORMATION SYSTEMS	HIS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts and importance of health information systems, demonstrating a solid grasp of the key principles and significance of these systems in managing and improving healthcare services.	2	PO1, PSO1
CO2	Identify and utilize various data sources and formats commonly used in health information systems, showcasing the ability to recognize and effectively work with diverse data types and sources relevant to healthcare information management.	3	PO1, PO5, PSO1
CO3	Analyze different health information system techniques and tools to determine their suitability for specific healthcare challenges, reflecting the capability to critically evaluate and select appropriate methodologies and tools for addressing particular issues in healthcare.	4	PO1, PO5, PSO1
CO4	Integrate various types of health information to derive meaningful healthcare insights, indicating the skill to combine and analyze different health data sources to generate valuable insights for healthcare decision-making and improvement.	4	PO1, PSO1
CO5	Implement a health information system project using relevant tools and platforms, demonstrating proficiency in applying appropriate technologies and methodologies to develop and manage a health information system project effectively.	3	PO1, PO5, PSO1

Syllabus

Overview of Health Information Systems, Types of health information (clinical, administrative, financial, etc.), Importance of health information systems in healthcare, Challenges in managing health information, Common data sources in healthcare (EHR, PHR, HIE, etc.), Data formats (HL7, FHIR, CDA, etc.), Data quality and preprocessing, Basic concepts of health information systems, Methods for data harmonization and standardization, Introduction to health informatics standards, Real-world examples of successful health information system implementations, Discussion on challenges and solutions in these case studies

Overview of health information system techniques (EHR systems, HIE, telemedicine, etc.), Pros and cons of different techniques, Tools and platforms (Epic, Cerner, Allscripts, etc.), Hands-on session with EHR systems, Introduction to relational databases (SQL), NoSQL databases (MongoDB, Neo4j), Hands-on session with SQL and MongoDB, Health informatics standards and interoperability (HL7, FHIR, etc.), Importance of metadata in health information systems, Implementing standards in health information system projects

Role of machine learning in health information systems, Algorithms and techniques (clustering, classification, etc.), Hands-on session with machine learning tools (TensorFlow, scikit-learn), Integration of clinical, administrative, and financial data, Computational tools for health information integration, Hands-on session with health information data, Network analysis in health information systems, Tools and techniques for network analysis (Cytoscape, STRING, etc.), Hands-on session with network analysis, Handling large-scale health information data, Cloud computing platforms (AWS, Google Cloud, etc.), Hands-on session with cloud-based health information systems

Integration of electronic health records (EHR), Clinical trials and cohort studies, Hands-on session with EHR data, Role of health information systems in personalized medicine, Case studies and applications, Applications in healthcare management and policy, Case studies and hands-on session with relevant data

Reference Books

1 Health Informatics: An Interprofessional Approach, Ramona Nelson, Nancy Staggers, 2016, Elsevier.

2 Introduction to Healthcare Information Technology, Mark Ciampa, Mark Revels, 2012, Cengage Learning.

3 Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Edward H. Shortliffe, James J. Cimino, 2013, Springer.

4 Handbook of Informatics for Nurses & Healthcare Professionals, Toni Lee Hebda, Kathy Hunter, 2018, Pearson.

23MRBI04 - BIOMEDICAL DATA INTEGRATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBI04	BIOMEDICAL DATA INTEGRATION	BDI	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts and importance of biomedical data integration, demonstrating a solid grasp of the key principles and the significance of integrating diverse biomedical data for advancing research and clinical applications.	2	PO1, PSO1
CO2	Identify and utilize various data sources and formats commonly used in biomedicine, showcasing the ability to recognize, access, and work with different types of biomedical data and formats to facilitate data integration.	3	PO1, PO5, PSO1
CO3	Analyze different data integration techniques and tools to determine their suitability for specific biomedical data challenges, reflecting the capability to critically evaluate and select appropriate methods and tools for addressing complex data integration issues in biomedicine.	4	PO1, PSO1
CO4	Integrate multi-omics data to derive meaningful biological insights, indicating the skill to combine genomic, transcriptomic, proteomic, and other omics data to uncover comprehensive biological insights and relationships.	4	PO1, PO5, PSO1
CO5	Examine a data integration project using bioinformatics tools and platforms, demonstrating proficiency in applying bioinformatics methodologies and technologies to execute and evaluate a data integration project, ensuring effective and insightful outcomes.	4	PO1, PO5, PSO1

Syllabus

Introduction to Biomedical Data Integration: Overview of Biomedical Data, Types of biomedical data (genomic, proteomic, clinical, imaging, etc.), Importance of data integration in biomedical research, Challenges in integrating biomedical data, Common data sources in biomedicine (NCBI, EBI, KEGG, etc.), Data formats (FASTA, FASTQ, VCF, BED, etc.), Data quality and preprocessing, Basic concepts of data integration, Methods for data harmonization and standardization, Introduction to ontologies and controlled vocabularies, Real-world examples of successful biomedical data integration, Discussion on challenges and solutions in these case studies

Tools and Techniques for Data Integration: Overview of data integration techniques (ETL, federated databases, etc.), Pros and cons of different techniques, Tools and platforms (Galaxy, Bioconductor, Cytoscape, etc.), Hands-on session with Galaxy, Introduction to relational databases (SQL), NoSQL databases (MongoDB, Neo4j), Hands-on session with SQL and MongoDB, Data standards and interoperability (HL7, FHIR, etc.), Importance of metadata in data integration, Implementing standards in data integration projects

Advanced Topics in Biomedical Data Integration: Role of machine learning in data integration, Algorithms and techniques (clustering, classification, etc.), Hands-on session with machine learning tools (TensorFlow, scikit-learn), Multi-omics data integration (genomics, transcriptomics, proteomics, etc.), Computational tools for multi-omics integration, Hands-on session with multi-omics data, Network biology and its applications in data integration, Tools and techniques for network analysis (Cytoscape, STRING, etc.), Hands-on session with network analysis, Handling large-scale biomedical data, Cloud computing platforms (AWS, Google Cloud, etc.), Hands-on session with cloud-based data integration

Applications of Biomedical Data Integration: Integration of electronic health records (EHR), Clinical trials and cohort studies, Hands-on session with EHR data, Role of data integration in personalized medicine, Case studies and applications, Applications in drug discovery and development, Case studies and hands-on session with relevant data

Reference Books

1 Bioinformatics: Sequence and Genome Analysis, David W. Mount, 2004, Cold Spring Harbor Laboratory Press.

2 Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Edward H. Shortliffe, James J. Cimino, 2013, Springer.

3 Data Integration in the Life Sciences, Andreas Beyer, Volker Tresp, Hans-Peter Kriegel, Stefan Kramer, 2004, Springer.

4 Bioinformatics Data Skills: Reproducible and Robust Research with Open Source Tools, Vince Buffalo, 2015, O'Reilly Media.

23MRBM01 - BIOMEDICAL DATA INTEGRATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBM01	BIOMEDICAL DATA INTEGRATION	BMDI	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply knowledge to interpret data from sensors and instruments, using mathematical concepts.	3	PO1
CO2	Apply knowledge and Implement health information systems.	3	PO1
CO3	Apply skills in integrating biomedical data and using analytics for informed decision-making.	3	PO1
CO4	Apply skills in creating warehouses, and using analytics for informed decision-making.	3	PO4
CO5	To anlyze students with advanced skills in trends like IoT, which are highly valued in healthcare practices.	4	PO4

Syllabus

Introduction to Biomedical Data: Principles of biomedical sensors, instruments, and real-time signal processing. Advanced sensor technologies (wearables, implantables) for continuous monitoring.

Data Management in Biomedical Engineering: Health information systems, Electronic Health Records (EHR), and big data analytics. Security, privacy, and ethical considerations in managing patient information.

Biomedical Data Integration and Analytics: Techniques for integrating diverse biomedical data sources. Data warehouses, analytics, machine learning for predictive modeling. Patient-centric data integration, clinical trials, and research data management.

merging Trends and Applications: IoT for real-time biomedical data monitoring. Big data challenges and opportunities in biomedical engineering. Medical imaging data management and integration. Blockchain for data security, telehealth, and ethical considerations in biomedical data.

Reference Books

1 Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Edward H. Shortliffe, James J. Cimino, 2014, Springer.

2 Health Informatics: Practical Guide for Healthcare and Information Technology Professionals, Robert E. Hoyt, Ann K. Yoshihashi, 2021, Lulu.

3 Biomedical Signal Processing and Signal Modeling, Arnon Cohen, Israel Gannot, 2022, CRC Press.

4 Big Data in Healthcare: Statistical Analysis of Features in Selected Datasets, Sergio Manzi, Riccardo Rizzo, 2020, Springer.

23MRBM02 - MEDICAL IMAGING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBM02	MEDICAL IMAGING	MI	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply principles of medical imaging techniques, including X-ray, MRI, CT, and ultrasound, to accurately interpret diagnostic images: Understand and implement the core principles and technologies behind various medical imaging techniques such as X-ray, MRI, CT, and ultrasound	3	
CO2	Apply knowledge of image acquisition protocols to optimize image quality and minimize patient exposure to radiation: Understand and apply best practices in image acquisition protocols for different imaging modalities to achieve optimal image quality	3	
CO3	Apply digital image processing methods to enhance and analyze medical images for better diagnostic outcomes: Utilize digital image processing techniques to enhance the quality of medical images and extract valuable diagnostic information	3	
CO4	Apply understanding of anatomical and pathological features to identify abnormalities in various imaging modalities: Leverage knowledge of human anatomy and pathology to recognize and interpret abnormalities or diseases in medical images across different imaging modalities	3	
CO5	Apply ethical and professional standards in the handling, interpretation, and reporting of medical imaging data: Demonstrate adherence to ethical and professional standards in the practice of medical imaging, including maintaining patient confidentiality	3	

Syllabus

Principles of Medical Imaging Techniques Protocols for Image Acquisition: Learn the standard procedures for acquiring diagnostic images across different modalities including X-ray, MRI, CT, and ultrasound, focusing on technical steps for each imaging method.
 Techniques to Enhance Image Quality: Explore methods to improve the clarity and detail of medical images, including optimization of imaging parameters, contrast adjustments, and resolution improvements.

Image Acquisition and Optimization Protocols for Image Acquisition: Detailed examination of the procedures for obtaining high-quality images, including patient preparation, selection of imaging modalities, and step-by-step imaging processes for different clinical scenarios, Equipment Calibration and Maintenance: Techniques for effective calibration of imaging equipment, including procedures for periodic checks, adjustments for optimal performance, and preventive maintenance strategies.

Digital Image Processing MethodsIntroduction to Digital Image Processing: Basics of digital image processing, including the fundamental concepts, tools, and techniques used to manipulate and analyze medical images. Image Segmentation and Reconstruction: Methods for segmenting anatomical structures and reconstructing images from raw data, including algorithms for delineating regions of interest and creating three-dimensional models.

Anatomical and Pathological Feature Identification Description: Review of human anatomy in medical imaging; Identifying normal and abnormal features; Pathological patterns in different imaging modalities; Case studies on disease diagnosis; Correlation with clinical findings. ase Studies on Disease Diagnosis: Real-world case studies demonstrating the application of imaging techniques to diagnose a range of medical conditions, including review of case histories, image analyses, and diagnostic decision-making processes.

Reference Books

1 Medical Imaging: Principles and Practice, William R. Hendee, E. Russell Ritenour, 2002, Wiley-Liss.

2 Radiologic Science for Technologists, Stewart C. Bushong, 2021, Elsevier.

3 Introduction to Medical Imaging, Nadine Barrie Smith, Andrew Webb, 2010, Cambridge University Press.

4 Essentials of Radiographic Physics and Imaging, James Johnston, Terri L. Fauber, 2012, Elsevier.

5 Diagnostic Imaging: Inside Out, Michael L. Giger, Nico Karssemeijer, Maryellen L. Giger, 2002, Elsevier Academic Press.

23MRBM03 - PHARMACEUTICAL ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBM03	PHARMACEUTICAL ENGINEERING	PME	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the methods of Gene transfer,Production of Secondary Metabolites, Drug Interactions, and Surgical supplies	3	PO1, PO3, PSO2
CO2	Apply the concept of Pharmaceutical dosage and products in treating diseases	3	PO1, PO3, PSO2
CO3	Apply the role of Biologicals (Immunizing agents and allergenic extracts)	3	PO4, PO5, PSO2
CO4	Apply the concept of Production & analysis in Biopharmaceuticals	3	PO4, PO5, PSO2
CO5	Apply the principles of pharmaceutical biotechnology for development of drug dosage forms	3	PO4, PO5

Syllabus

Fundamentals of pharmaceutical practice-Pharmaceutical biotechnology: An introduction; Origin & definition; Scope & Importance of Biotechnology; their applications; Microbes in Pharmaceutical industry; Methods of Gene transfer; Biotechnology; Production of Secondary Metabolites ; Drug Interactions;Surgical supplies

Drug metabolism and pharmacokinetics- ADME-properties-Mechanism of Drug Absorption; Distribution of drugs; Drugmetabolism(Biotransformation of drugs);Excretion of drugs; Pharmacokinetics; Basic considerations; Controlled Release Medication; Design of Controlled drugdelivery systems; Drug release patterns; Oral parental; Trans-dermal ; Ophthalmic ; Intra-vaginal and Intrauterine Drug Delivery systems

Pharmaceutical products-Fundamentals of Therapeutic categories such as Analgesics, Anesthetics, Antipyretic; Anti-inflammatorydrugs; Antacids; Alkaloids; Glycosides; Hormone & Hormone antagonists; Antineoplastics and Immuno active drugs; Biologicals (Immunizing agents andallergenic extracts)

Drug manufacturing processes- Good manufacturing practices; Manufacturing facilities; Sources of Biopharmaceuticals; Production & analysis of Biopharmaceuticals

Experiment 1: Introductory Session to Pharmaceutical Biotechnology Laboratories Experiment 2: Preparation of various Polymeric Solution Experiment 3: Viscosity measurement of polymer solution Experiment 4: Development of Physical Hydrogels Experiment 5: Preparation of Chemical Hydrogels Experiment 6: Formulation of Chitosan and Gelatin-Based Hydrogels Loaded with Drug Experiment 7: Swelling Study of Hydrogels Experiment 8: Demonstration of Dissolution Apparatus Experiment 9: In vitro Hemocompatibility Testing of Physical Hydrogels Experiment 10: In vitro Hemocompatibility Testing of Chemical Hydrogels Experiment 11: Mucoadhesive analysis in Chemical Hydrogels Experiment 12: Franz diffusion cell apparatus Setup Experiment 13: In silico analysis for identifying drug interactions and their phenotypic effects

Reference Books

1 The Theory and Practice of Industrial Pharmacy, Leon Lachman, 2020, CBS.

2 Pharmaceutical Biotechnology, S S Purohit, H N Kakrani, A K Saluja, 2003, ARE Books.

3 Tissue Engineering. Engineering Principles for Organs and Tissues for the Design of Replacement, W Mark Saltzman, 2004, Oxford University Press.

4 Pharmaceutical Laboratory Procedures, Jahangir Moini, 2010, Cengage.

23MRBM04 - REGENERATIVE MEDICINE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBM04	REGENERATIVE MEDICINE	RM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the strategies for isolation and maintenance of embryonic stem cells	3	PO1
CO2	Apply the aspects of stem cell niche to understand regulationof stemness	3	PO4
CO3	Apply different cues and strategies for stem cell differentiation and characterization	3	PO2
CO4	Apply the role of stem cells in targeted therapy and organ development	3	PO4
CO5	Apply the principles of stem cell technology for upskilling on the practical front and analyzing stem cell behaviour	4	PO4

Syllabus

Human embryonic development Stem cells classification, Stem cell propertie Embryonic stem cells Embryo preparation IVF SCNT, Inner cell mass isolation, ESC maintenance role offeeder layer Feeder free culture, media requirement. Molecular basis of pluripotency transcription factors,signaling pathways,Cell surface markers Human mouse stem cells.

Adult stem cells, Adult mammalian stem cell niche basic design, Epidermal stem cell niche, Stem cell niche in woundregeneration, Intestinal stem cell niche, Hematopoietic stem cell niche, iPSCs, small molecules in

Epigenetic factors in stem cell biology, Characterization of stem cells, Stem cell differentiation, Gene editing technologies: CRISPR/Cas9 and stem cells Organoids and their applications Stem cell-based bioprinting and tissue engineering

Tissue engineering and Stem cell therapy heart diseases, diabetes, burns skinulcers, muscular dystrophy, Public perception and societal implications,Regulatory frameworks and policies governing stem cell use

Cell based therapies using Tissue engineering triad, High-throughput screening using stem cell-derived cells Identifying drug targets and testing drug efficacy Case studies: pharmaceutical applications and industry impact

Reference Books

1 Essentials of Stem cell biology, Rober Lanza, 2010, Elsevier academic press.

2 Tissue engineering and artificial organs, Biomedical engineering hand book, Joseph D. Bronzino, 2008, CRC Press.

3 Tissue Engineering: Engineering Principles for the Design of Replacement Organs and Tissues, W Mark Saltzman, 2020, Oxford University Press.

4 Stem Cell Biology: A Practical Laboratory Manual, Indumathi Somasundaram, 2008, Indumathi Somasundaram.

23MRBU01M - INTRODUCTION TO BUSINESS ANALYTICS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBU01M	INTRODUCTION TO BUSINESS ANALYTICS	IBA	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate a foundational knowledge of the business analyst role.	2	PO2, PO5
CO2	Apply the data analytics lifecycle framework.	3	PO2, PO5
CO3	Experiment with the foundational project management topics and skills used by a BI analyst.	3	PO2, PO5, PO8
CO4	Implement data literacy and its importance for a BI analyst.	3	PO2, PO5, PO8

Syllabus

Why Business Analytics,What Is a Business Intelligence Analyst,Business Analysis vs. Business Analytics,Business Analytics vs. Data Analytics,What Is a Business Analyst,Role of a Business Analyst,Business Analysis Process Framework

Introduction to Analytics,A Data-Driven Business,Types of Analytics,Which Analytics Should You Use,Data Analytics Lifecycle,Six Phases of the Data Analytics Lifecycle Framework.

Project Management in Business Analytics,Project Manager vs. Business Analyst,The Project Lifecycle for Business Analytics Projects,The Project Charter for Business Analytics Projects,,Project Management Methodologies Agile Planning for Business Analytics Projects,.

The Importance of Data Literacy for the Business Analyst,Data Literacy Basics,Well-Structured Data,Variables and Field Types,Aggregation and Granularity,Statistics Cheat Sheet

Reference Books

1 Business Analytics: Data Analysis & Decision Making, S. Christian Albright, Wayne L. Winston, 7th Edition, Cengage Learning.

2 Business Analytics: The Art of Modeling with Spreadsheets, Stephen G. Powell, Kenneth R. Baker, 5th Edition, Wiley.

3 Business Intelligence, Analytics, and Data Science: A Managerial Perspective, Ramesh Sharda, Dursun Delen, Efraim Turban, 5th Edition, Pearson.

4 Business Analytics: Principles, Concepts, and Applications with SAS, Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, 1st Edition, Pearson.

23MRBU02M - PREDICTIVE MODELING AND ANALYTICS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBU02M	PREDICTIVE MODELING AND ANALYTICS	PAM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply appropriate predictive modeling techniques to real-world datasets, using tools like Python, R, or specialized analytics software	3	PO3, PO4, PO6
CO2	Analyze the performance of predictive models by diagnosing issues such as overfitting, underfitting, and data bias, and suggest appropriate corrective actions.	3	PO2, PO3, PO4
CO3	Eevaluate predictive models by comparing performance metrics such as accuracy, precision, recall, and F1 score, and make data-driven decisions on model selection.	4	PO3, PO4, PO6
CO4	Create customized predictive solutions by designing, optimizing, and integrating models tailored to specific business or research problems, leveraging advanced techniques like ensemble learning or deep learning.	5	PO3, PO4, PO6

Syllabus

Apply Predictive Modeling: Apply an overview of Predictive Analytics by exploring different types of predictive models, including Regression, Classification, and Time-Series analysis, and applying these concepts to various applications and use cases across different industries.

Analyze Regression and Classification models, including Linear and Logistic Regression, along with Regularization Techniques such as Ridge, Lasso, and Elastic Net. Delve into model assumptions and diagnostic checks, and analyze the effectiveness of Decision Trees, Random Forest, and Gradient Boosting. Also, explore Support Vector Machines (SVM) and k-Nearest Neighbors (k-NN), and evaluate model performance using metrics like Accuracy, Precision, Recall, F1 Score, and the ROC Curve.

Time-Series Forecasting and clustering:Time-Series Data Analysis and Decomposition ARIMA, Exponential Smoothing, and Prophet Models Forecast Accuracy Metrics.Partitioning Methods,Hierarchical Clustering.

Markov Chain Monte Carlo methods and Advanced Topics in Predictive Modeling :Markov Chains,Monte Carlo Methods,MCMC Framework, Introduction to Neural Networks for Predictive Analytics Model Interpretability and Explainability

Reference Books

1. "Data Science for Business", Foster Provost and Tom Fawcett, 27 July 2013, O'Reilly Media.
2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" , Aur?lien G?ron, 18 sep 2020, O'Reilly Media.
3. "Applied Predictive Modeling", Max Kuhn and Kjell Johnson, april 2018, springer.
4. "Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python", Peter Bruce and Andrew Bruce, 10 April 2020, O'Reilly Media.
5. "Machine Learning for Asset Managers" , Marcos L?pez de Prado, 22 April 2020, Cambridge University Press.

23MRBU03M - DATA MINING AND MACHINE LEARNING (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBU03M	DATA MINING AND MACHINE LEARNING	DMML	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts and techniques of data mining, including data preprocessing and exploration	2	PO2, PO5
CO2	Apply association rule mining techniques to discover patterns in large datasets	3	PO2, PO5
CO3	Design and implement classification models for predictive analytics.	3	PO2, PO5, PO8
CO4	Utilize dimensionality reduction techniques to simplify data while retaining important information	3	PO2, PO5, PO8

Syllabus

Overview of Data Mining: Definition, Evolution, and Importance, Types of Data: Structured, Semi-Structured, and Unstructured Data, Data Preprocessing: Data Cleaning, Integration, Transformation, Reduction, and Discretization, Data Exploration: Statistical Descriptions of Data, Visualization Techniques, Introduction to Data Warehousing: Concepts, Architecture, and Process.

Association Rule Mining: Market Basket Analysis, Apriori Algorithm, FP-Growth Algorithm, Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Model Evaluation: Accuracy, Precision, Recall, F-Measure, ROC Curves. Advanced Classification Techniques: k-Nearest Neighbors (k-NN), Support Vector Machines (SVMs), Ensemble Methods (Bagging, Boosting).

Clustering: Basic Concepts, k-Means, Hierarchical Clustering, DBSCAN. Cluster Evaluation: Internal and External Validation Measures. Dimensionality Reduction: Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA). Handling High-Dimensional Data: Feature Selection and Feature Extraction Techniques.

ntroduction to Machine Learning: Supervised vs. Unsupervised Learning, Regression Analysis: Linear Regression, Logistic Regression, Ridge and Lasso Regression, Neural Networks: Basics, Multi-Layer Perceptron, Backpropagation, Applications of Machine Learning: Natural Language Processing, Computer Vision, Recommender Systems, Ethical Considerations in Data Mining and Machine Learning.

Reference Books

1 Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, 2011, Morgan Kaufmann.

2 Pattern Recognition and Machine Learning, Christopher M. Bishop, 2006, Springer.

3 Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. M?ller, Sarah Guido, 2016, O'Reilly Media.

4 Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, 2016, Morgan Kaufmann.

23MRBU04M - MARKETING ANALYTICS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBU04M	MARKETING ANALYTICS	MAT	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Describe the process of improving marketing strategies with data and Analytics methods.	2	PO2, PO5, PO9, PSO2
CO2	Demonstrate the method to define a brand architecture and to measure the impact of marketing efforts on brand value over time.	2	PO2, PO5, PO9, PSO2
CO3	Apply customer lifetime value and strategic marketing alternatives based on customer retention and lifetime value.	3	PO2, PO5, PO9, PSO2
CO4	Conduct effective experiments for marketing campaigns- and apply results to make future marketing decisions.	4	PO2, PO5, PO9, PSO2

Syllabus

Why Marketing Analytics? Introduction to the Marketing Process, Airbnb Marketing Process, Airbnb\'s Strategic Challenge, Airbnb\'s Marketing Strategy with Data, Using Text Analytics, Utilizing Data to Improve Marketing Strategy

Napple and Brand Value, Developing Brand Personality, Brand Personality: Red Bull, Developing Brand Architecture, Brand Architecture: Red Bull, Brand Architecture: Etch A Sketch, Measuring Brand Value, Measuring Brand Value: Key Points, Revenue Premium as a Measure of Brand Equity, Calculating Brand Value: Snapple

Customer Lifetime Value (CLV), Customer Lifetime Value Netflix, Calculating CLV, Understanding the CLV Formula, Applying the CLV Formula Netflix, Extending the CLV Formula, Extending the CLV Formula, Using CLV to Make Decisions: IBM, CLV, A Forward Looking Measure

Determining Cause and Effect through Experiments, Designing Basic Experiments, Designing Before After Experiments, Designing Full Factorial Web Experiments, Designing an Experiment Etch A Sketch, Analyzing an Experiment Etch A Sketch, Analyzing an Experiment Betty Spaghetty, Projecting Lift, Calculating Projected Lift, Betty Spaghetty, Pitfalls of Marketing Experiments Betty Spaghetty, Maximizing Effectiveness Nanoblocks, Takeaways Marketing Experiments

Reference Books

1. Marketing Analytics, Robert W. Palmatier, Associate Professor J. Andrew Petersen, 31 July 2022, Bloomsbury Academic India.
2. Marketing Analytics: Data-Driven Techniques with Microsoft Excel, Wayne L. Winston, 1, wiley.
3. Essentials of Marketing Analytics , Jr Joseph F. Hair (Author), Dana E. Harrison , Haya Ajjan , Atanu Adhikari, 1, McGraw Hill.
4. Marketing Metrics: The Manager's Guide to Measuring Marketing Performance, Neil Bendle (Author), Paul Farris (Author), Phillip Pfeifer (Author), David Reibstein (Author) , 4, Pearson.

23MRBU05M - FINANCIAL ANALYTICS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBU05M	FINANCIAL ANALYTICS	FAT	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding of financial analysis, proficiency in interpreting key financial statements, analyze and interpret financial data and market information to make informed financial decisions and recommendations.	2	PO1, PO3, PO4, PSO1, PSO2
CO2	Represent key financial metrics including revenues, expenses, and cash flows and critically analyze financial data and effectively communicate financial analysis results and model outputs to stakeholders	2	PO2, PO4, PO6, PSO2, PSO3
CO3	Examine key valuation techniques, effective risk management strategies, and methods for optimizing investment portfolios.	3	PO1, PO2, PO4, PSO1, PSO2
CO4	Apply advanced statistical methods and statistical software to analyze financial data, communicate complex financial insights to diverse audience.	3	PO3, PO4, PO6, PSO1, PSO2

Syllabus

Introduction to Financial Analysis & Financial Markets : Overview of financial analysis, Key financial statements- Balance Sheet, Income Statement, Cash Flow Statement, Understanding financial metrics and ratios. Financial Markets - Functions and Types of Financial Markets, Financial Instruments: Stocks, Bonds, and Derivatives

Financial Statement Analysis: Techniques for analyzing financial statements, Ratio analysis: liquidity, profitability, solvency, and efficiency ratios, Trend analysis and benchmarking Financial Modeling :Building financial models in Excel or similar tools, Forecasting revenues, expenses, and cash flows, Scenario and sensitivity analysis

Investment Analysis :Valuation techniques: Discounted Cash Flow (DCF), Comparable Company Analysis (CCA), and Precedent Transactions, Risk assessment and management, Portfolio analysis and optimization

Advanced Analytical Techniques: Application of statistical methods in finance, Use of financial analytics software and tools, Introduction to machine learning in financial analysis.Communication and Reporting :Effective communication of financial insights, Preparing and presenting financial reports, Stakeholder management and decision support.

Reference Books

1 Financial Planning & Analysis and Performance Management, Jack Alexander, 2018, John Wiley & Sons.

2 Financial Statement Analysis: A Practitioner's Guide, Martin S. Fridson, Fernando Alvarez, 4, Wiley.

3 Financial Analytics with R: Building a Laptop Laboratory for Data Science , Mark J. Bennett, Dirk L. Hugen, 1, Cambridge University Press.

4 Financial Analysis and Modeling Using Excel and VBA, Chandan Sengupta, 2010, Wiley .

5 Financial Reporting and Analysis, Dhamija Sanjay , 1, Sultan Chand & Sons.

23MRBU06M - SUPPLY CHAIN ANALYTICS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBU06M	SUPPLY CHAIN ANALYTICS	SCAT	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Explain the fundamental concepts and terminology used in supply chain analytics.	2	PO1, PO6
CO2	Apply basic data analysis techniques to real-world supply chain scenarios to forecast demand and manage inventory.	3	PO2, PO3
CO3	Analyze supply chain data to identify inefficiencies and recommend improvements in supply chain processes.	4	PO3, PO4, PO6
CO4	Interpret the results of supply chain optimization models to make informed decisions that enhance supply chain performance.	4	PO5, PO6

Syllabus

Introduction to Supply Chain Analytics-Understanding the components and functions of supply chains, Introduction to Analytics: Basic data analytics concepts, tools, and their applications in supply chain management, Demand Forecasting: Techniques for predicting demand, including trend analysis, seasonality, and the use of historical data, Supply Chain Planning: Strategies for effective supply chain planning and the integration of forecasts into planning processes.

Demand and Inventory Analytics - Demand Analytics: Predicting demand using advanced analytics, understanding demand drivers, and customizing strategies based on product type, Inventory Management: Techniques for inventory classification, managing safety stock, and understanding the impact of inventory on financial performance, Inventory Optimization: Use of analytics to optimize inventory levels and reduce holding costs while ensuring product availability.

Supply Chain Optimization and Prescriptive Analytics - Supply Chain Optimization: Introduction to optimization models, including linear programming and mixed-integer programming, and their applications in supply chain management, Prescriptive Analytics: Using data to recommend actions and optimize decision-making across the supply chain, Machine Learning Applications: Applying machine learning algorithms to forecast demand, optimize production, and improve supply chain efficiency.

Supply Chain Finance, Security, and Sustainability - Supply Chain Finance: Understanding cost control, procurement, and the financial impact of supply chain decisions, Security in Supply Chains: Identifying and mitigating risks related to supply chain security, including physical and cybersecurity, Sustainability in Supply Chains: Integrating sustainability into supply chain strategies, reducing environmental impact, and using analytics to support sustainable practices, Capstone Project: A comprehensive project that integrates concepts from all modules, focusing on real-world supply chain challenges and solutions.

Reference Books

1 Supply Chain Management: Strategy, Planning, and Operation, Sunil Chopra, Peter Meindl , 7th Edition, Pearson Education.

2 Supply Chain Analytics: A Handbook of Methods and Applications, Peter W. Robertson, 1st Edition, Springer.

3 Designing and Managing the Supply Chain, David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, 3rd Edition, McGraw-Hill Education.

4 Operations and Supply Chain Management, F. Robert Jacobs, Richard Chase, 15th Edition, McGraw-Hill Education.

23MRBU07M - HEALTHCARE ANALYTICS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBU07M	HEALTHCARE ANALYTICS	HCAT	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Explain the role of healthcare analytics within data science and business analytics.	2	PO1, PO2, PO3
CO2	Identify and choose relevant healthcare outcomes.	3	PO1, PO2, PO4
CO3	Analyze healthcare data, interpret results, and discuss challenges in data collection and implementation of plans based on the data.	4	PO1, PO2, PO4
CO4	Analyze high reliability organizations in healthcare.	4	PO1, PO2, PO3

Syllabus

This course will help you to see how healthcare analytics fits into data science and business analytics. It will invite you to apply analytical thinking to understanding healthcare delivery ,improving quality of patient care.and integrating analytics into the organizations overall strategy.

In this module, you will learn about the various aspects of healthcare outcomes and how you can choose the relevant and important ones. You will be introduced to the different types of measurements, the challenges of outcome measurement, and the importance of Patient-Reported Outcomes Measurements (PROMs). You will also learn about analyzing data, interpreting the results, and the challenges involved in collecting the data and using it to implement plans.

In this module, you will learn how to define quality of care, explain the components of evaluating physicians and discuss how formal performance measures, as well as surveys, are tracked and reported. The content covered in this module will provide a better understanding of the relationship between using business analytics to guide and influence both process and change management.

In this module you will learn about physician burnout and its effects on patient care, the importance of the peer review panel process to ensuring quality care delivery, the characteristics and sustainability of high reliability organizations, and the role of business analytics to identify errors in high reliability organizations.

Reference Books

1 Healthcare Analytics, Hui Yang, Eva K. Lee, 2007, Wiley.

2 Data Science for Healthcare, Sergio Consoli, Diego Reforgiato Recupero, Milan Petkovic, 2012, Springer.

3 Healthcare Data Analytics, Chandan K. Reddy, Charu C. Aggarwal, 2012, Chapman and Hall/CRC.

4 Big Data in Healthcare, Farrokh Alemi, David W. Drukker, John Guo, Arnaldo Perez, 2012, CRC Press.

5 Predictive Analytics in Healthcare, Cynthia McCauley, Bradley Malin, Simon Lin, 2012, Springer.

23MRCA01 - INTRODUCTION TO CREATIVE ARTS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCA01	INTRODUCTION TO CREATIVE ARTS	ICA	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the present research and study the comprehensive knowledge of combined creative areas of specialisation and build a theoretical framework for students creative practice	2	PO1
CO2	Understand synthesise and articulate student critical, contextual and conceptual knowledge and understanding into a coherent critique of advanced academic standard	2	PO2
CO3	Apply the techniques of pioneers work of art and their thought process of creative thinking , student own criteria of judgement, review.	3	PO3

Syllabus

Experience Creative Arts -practicing art & craft in a playfull mode with different materials

Creative Arts Relations-Using personal experiences and textual knowledge, Writing Skills,Art of Poetry , Scriptwriting, Drawing Skills, Graphic Design ,Core Concepts , Illustration- Key Steps in Illustration

The Practice of Painting ,Photography Expressing Your Vision Printmaking ,Sculpture ,Textiles ,Visual Studies Writing Short Fiction , Form and Experience ,Understanding Visual Culture

Reference Books

1 Drawing on the Right Side of the Brain, Betty Edwards, January 2012, Penguin Books .

2 The Crafter's Devotional: 365 Days of Tips, Tricks, and Techniques for Unlocking Your Creative Spirit, Barbara Call, 1 September 2010, Quarry Books .

3 THE DESIGN OF EVERYDAY THINGS, Don Norman , 5 November 2013, Basic Books.

4 On Writing: A Memoir of the Craft, Stephen King, 2 June 2020, Scribner.

23MRCA02 - DRAWING AND SKETCHING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCA02	DRAWING AND SKETCHING	DAS	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To understand the drawing anatomy ,Skull planes, Masses, Details, Proportions, Portraiture, Compositional Analysis, Theories, and treatments.	2	PO1
CO2	Understand various kinds of Mediums in drawing for painting & sculpting	2	PO2
CO3	Apply the principles and theories of Drawing to the contemporary ideas and experiments toi get new forms and new meanings .	3	PO3

Syllabus

Skull planes, Masses, Details, Proportions, Portraiture, Compositional Analysis, Theories, and treatments. Unit-I Anatomy Drawing: Starting from the construction of skull-planes and masses of head, details such as eyes, nose, mouth, etc. Relative proportions amongst head, neck, and shoulders. The student has to prepare for every part of the body like the skull, Torso, legs, hands, body in movement, foreshortening views, etc detailed study of Bone, muscle, the contour of human, animal, and bird. Freehand Sketching: At least 10 sketches daily related to the subject assignments to improve their ability towards the professional way.

Cultural Drawing: Different civilizations approach withdrawing from Cave paintings, medieval art, and design, Folk art, traditional arts, pre, and post-independence art, and contemporary art practice. Transformation Drawing: Process of converting an idea into drawing with aesthetic values, specific rules and regulations use full for creative and innovative design ideas

Animation Oriented Drawing:Caricature,Character Design,Still and motion drawings ,story board preparation-content oriented script based. Aero Dynamic Drawing:Product Design oriented and Auto mobile Dynamic Design operation according to science principles. Advertising Drawings : Ad making traditional practice and also with Photoshop soft ware Creative Drawing: Contemporary Art treatments and Art theories .

Reference Books

1 Drawing and Sketching Portraits: How to Draw Realistic Portraits for Beginners- , Jacquelyn Descanso , 12 November 2015, Createspace Independent Pub.

2 Drawing: A Complete Guide, Giovanni Civardi, Mar 10 2010, Search Press; Illustrated edition .

3 The Big Book of Realistic Drawing Secrets: Easy Techniques for drawing people, animals, flowers and nature , Carrie Stuart Parks , Jun 13 2009, Rick Parks.

4 The Complete Book of Poses for Artists: A comprehensive photographic and illustrated reference book for learning to draw more than 500 poses , Ken Goldman, 16 January 2017, Walter Foster Publishing.

23MRCA03 - PAINTING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCA03	PAINTING	PNT	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental processes of visual perception and artistic expressions from the art works of great artists series	2	PO1
CO2	Understand the painting mediums and various methodologies from history of art	2	PO2
CO3	Apply the techniques,processes into art making with the support of history of art evaluation	3	PO3

Syllabus

DRAWING (MANMADE & NATURE): Study from manmade objects and nature with emphasis on construction. Perspective and rendering in linear and massive drawing. Experience with material quality for feel, Values in grey, Texture and colour in rendering.

Art practices through history of art from prehistoric to 20th centuary traditional and folk art

Apply the aesthetics with 20th centuary ART Practices and also study in past- present idealogies in Indian & westren cultures

Reference Books

1 Chinese Techniques of Water Colour,, Lian Quan Zhen, 2020, North Light Books, Cincinnati,Ohio,China -2002.

2 History of art , HW jason , 2019, johnson & jonson.

3 Drawing and Painting: Materials and Techniques for Contemporary Artists, Kate Wilson , 2017, Thames & Hudson.

4 Modern Acrylic: A contemporary exploration of acrylic painting (Modern Series), Blakely Little , 2 October 2018, Walter Foster Publishing.

23MRCA04 - CREATIVE WRITING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCA04	CREATIVE WRITING	CWT	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Develop original and compelling narratives, characters, and dialogue suitable for film and media projects.	3	PO6
CO2	Apply industry-standard formatting and techniques to write professional-quality scripts and screenplays for various media formats.	3	PO9
CO3	Critique and revise their own and peers\' creative works, providing constructive feedback and implementing revisions to enhance the overall quality of the writing.	3	PO10

Syllabus

The Power of Story: Understanding the importance of storytelling in film and media. Elements of Story Structure: Exploring the Three-Act Structure, plot points, and narrative arcs. Developing Engaging Characters: Creating dynamic characters, including protagonists, antagonists, and supporting roles. Screenplay Formats and Conventions: Learning industry-standard formatting for scripts and screenplays. Writing Effective Dialogue: Techniques for crafting authentic and compelling dialogue.

Genre and Audience Considerations: Writing for different genres (e.g., drama, comedy, thriller) and understanding target audiences. Scene Construction and Sequencing: Building effective scenes and sequencing them for maximum impact. Visual Storytelling: Using descriptions and actions to convey visual elements and emotions. Adaptation Techniques: Adapting existing works (e.g., books, plays) into screenplays and scripts. Feedback and Revision: Techniques for revising and improving scripts based on feedback.

Self-Editing Techniques: Methods for self-revision, focusing on structure, clarity, and coherence. Peer Review Workshops: Participating in peer review sessions, learning to give and receive constructive feedback. Final Project: Revising and polishing a substantial piece of creative writing for publication or presentation, incorporating feedback and self-editing techniques.

Reference Books

1 Screenplay: The foundations of screenwriting., Field, S. , 2005, Delta.

2 Story: Substance, structure, style, and the principles of screenwriting., McKee, R., 1997, ReganBooks..

3 Writing screenplays that sell , Seger, L. , 2010, Michael Wiese Productions..

4 The Screenwriter's Bible: A complete guide to writing, formatting, and selling your script , Trottier, D. , 2014, Silman-James Press..

23MRCL01 - PRINCIPLES OF COMPANIES ACT AND CORPORATE GOVERNANCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCL01	PRINCIPLES OF COMPANIES ACT AND CORPORATE GOVERNANCE	PCACG	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To provide a comprehensive understanding of the legal framework governing the formation, operation, and winding up of companies in India	2	PO1
CO2	To develop a strong foundation in corporate governance principles and practices.	2	PO6
CO3	To equip students with the knowledge to analyze and evaluate corporate legal and governance issues.	2	PO3
CO4	To foster critical thinking and problem-solving skills in relation to corporate law and governance challenges.	3	, PSO1
CO5	To prepare students for professional roles in corporate law, compliance, and governance	3	PO8

Syllabus

Formation and Incorporation of Companies Nature and Definition of a Company Corporate Personality Classification of Companies Incorporation Procedure Memorandum and Articles of Association Doctrine of Ultra Vires Prospectus and Share Capital

Management and Administration of Companies Corporate Management Structure Board of Directors: Appointment, Powers, Duties, and Liabilities Meetings of the Company Dividends and Bonus Shares Debentures Alteration of Memorandum and Articles of Association

Corporate Governance and Corporate Social Responsibility Concept of Corporate Governance Principles of Corporate Governance Corporate Social Responsibility Independent Directors Committees of the Board Risk Management Corporate Governance Codes

Students will understand the ethical responsibilities of directors and other corporate stakeholders and the role of corporate governance in promoting ethical business conduct

Reference Books

1 Company Law, Avtar Singh, 2023, Lexis Nexis.

2 rinciples of Modern Company Law, Gower, 2020, Estern.

3 Company Law, A.K. Majumdar, 2019, Lexis Nexis.

4 Law of Corporate Governance, Deepankar Sharma, 1st Edition, 2020, Central Law Publication.

23MRCL02 - MERGERS, ACQUISITIONS AND PRIVATE EQUITY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCL02	MERGERS, ACQUISITIONS AND PRIVATE EQUITY	MAPE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the strategic perspective & strategic approaches to M & A.	2	PO3
CO2	Understand the Merger Process and process of merger intergtation	2	PO9
CO3	Understand the methods of financing mergers.	2	PO2
CO4	Apply the Taxation and Accounting aspects of Mergers and Acquisitions	3	PO6
CO5	Evaluate the issues involved in takeover process and identify areas of reform.	4	

Syllabus

Introduction

Corporate Restructuring

Valuations and Takeovers

Legal Taxation and Accounting Aspects

Reference Books

1 Value Creation From Mergers And Acquisitions, SudiSudarsanam, 2014, Pearson Education.

2 Merger Acquisitions & Corporate Restructuring, Chandrashekar Krishna Murthy &Vishwanath. S.R, 2012, S.R, Sage Publication..

3 Takeovers,Restructuring And Corporate Governance , Weston, Mitchel And Mulherin, 2012, Pearson Education.

4 Corporate Growth Through Mergers And Acquisitions, Shiv Ramu, 2016, Response Books.

5 Mergers And Acquisitions, P Mohan Rao, 2016, Deep And Deep Publications.

23MRCL03 - INSOLVENCY AND BANKRUPTCY LAW (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCL03	INSOLVENCY AND BANKRUPTCY LAW	IBL	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	A comprehensive knowledge of bankruptcy and insolvency laws.	2	
CO2	Understand international bankruptcy and dispute resolution regarding cross-border insolvency.	2	
CO3	Understand the procedures to be followed in case of corporate insolvency.	2	
CO4	Analyse the new Insolvency and Bankruptcy Code, 2016 and its implication.	3	
CO5	Analyse the implications of Insolvency and Bankruptcy laws.	3	

Syllabus

Origin and Development of bankruptcy and insolvency law - need of bankruptcy and insolvency law

Companies Act; 1956 RDDBFI Act, 1993; SARFAESI Act, 2002; SICA Act, 1985; The Presidency Towns Insolvency Act, 1909; The Provincial Insolvency Act, 1920; Chapter XIII of the LLP Act, 2008; Corporate Debt Restructuring Scheme, Strategic Debt Restructuring, and Scheme for Sustainable Structuring of Stressed Assets

Challenges in the Transition to the New Insolvency and Bankruptcy Code

Contemporary issues

Reference Books

1 The Law of Insolvency in India, Sir. Dinshaw Fardunji Mulla, 2013, Lexis Nexis.

2 Guide to Insolvency and Bankruptcy Code 2016, Sir. Dinshaw Fardunji Mulla, 2017, Taxmann Publications Pvt. Ltd.

3 Commentary on the Insolvency and Bankruptcy Code, 2016, Manzar Saeed, 2017, Lexis Nexis.

4 Personal Insolvency in the 21st Century: A Comparative Analysis of the US and Europe, Iain Ramsay, 2017, Hart Publishing.

5 Guide to SARFAESI Act 2002 & Recovery of Debts and Bankruptcy Act 1993, Murdoch, 2016, Taxmann Publications Pvt. Ltd.

23MRCL04 - COMPETITION LAW AND PRACTICE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCL04	COMPETITION LAW AND PRACTICE	CLP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic principles of fair competition and constitutional perspectives.	2	PO6
CO2	Differentiate various types of anti-competitive practices	2	PO1
CO3	Understand and able to conduct research on emerging trends in competition law.	2	PO3
CO4	Analyse the international perspectives of competition law.	3	PO7
CO5	Analyse the role Competition Act, 2002 in regulating anti-competitive practices, promote fair competition and enforcement procedures.	3	

Syllabus

History of Competition law, Development in UK and US, An Overview of Legal Framework in USA and UK and EC

Competition law in India History and Development of Competition Law in India - Sachar Committee, MRTP Act - Salient features and its amendment in 1991 - Liberalization and Globalization - Raghavan Committee Report

The Competition Act, 2002: An Overview of Competition Law in India - Important Definitions under the Competition Act, 2002 Anti- Competitive Agreements under the Competition Act, 2002

Authority : Enforcement Mechanisms under the Competition Act, 2002 ; Competition Commission of India ; Constitution of the CCI ; Powers and Functions, Jurisdiction of the CCI , adjudication and appeals - Director General , Competition Appellate Tribunal- Enforcement Mechanisms under the EU, UK and US Laws.

Reference Books

1 Commentary on the MRTP Law, Competition Law & Consumer Protection Law, S. M. Dugart, 2006, 4th Edition, Wadhwa & Co.

2 Competition Law & Cartels, P. S. Prasad, 2007, 10th Edition, The ICFAI University.

3 An introduction Guide to EC Competition Law & Practice, Valentine Korah, 2007, 2nd Edition, Hart Publishers.

4 Competition Law and Practice, D. P. Mittal, 2010, 5th Edition, Taxman Publications (P.) Ltd.

5 The Political Economy of Competition Law in Asia, Mark Williams, 2013, 8th Edition, Edward Elgar Publishing.

23MRCM01 - LINEAR ALGEBRA (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM01	LINEAR ALGEBRA	LAG	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Develop vector matrices and operations, properties of scaling and addition, matrix multiplication, generalized vectors.	3	PO1
CO2	Apply the concepts of linear Equations and solve system of linear equations with matrix methods,	3	PO3
CO3	Apply the concepts of Transposes and Inverses Column Picture of Matrix Multiplication named Algorithms Pivots, Ranks, Inverses and built the orthonormal basis by Grahm Smith Orthogonalization process	3	PO5
CO4	Identify the concepts of Eigen vectors invariant subspaces and Jordan Normal Forms Algorithms, Singular Value Decomposition and Fundamental Spaces and SVD	3	PO5

Syllabus

Introduction, Numerical Computations, Functions, Equations and Linearity, Linearity the Big Picture Vectors, Matrices and Their Operations Vectors Vector Operations Linear Independence of Vectors Matrices, Matrix Operations, Properties of Scaling and Addition, Matrix Multiplication, Generalized Vectors.

Transposes and Determinants Transpose of a Matrix Definitions and Matrices with Special Properties, Determinant of a Matrix Numerical Computations Gaussian Elimination Solvability of System of Linear Equations Gaussian Elimination Applications of Gaussian Elimination More Examples beyond Gaussian Elimination Ranks and Inverses of Matrices Rank of a Matrix, Gauss Jordan Elimination Inverse of a Matrix Left and Right Inverses, Cramers Rule Algebraic View of Linear Algebra.

IVector Spaces, Basis and Dimensions Linear Combinations, Vector Spaces and Subspaces Basis and Dimensions, Geometry of Linear Equations, Change of Basis, Orthogonally and Gram-Schmidt, Basis and Components Change of Basis Basis of Subspaces, Orthogonally Gram Schmidt Process Rotation Matrices A Generalization Product Rules: Transposes and Inverses Column Picture of Matrix Multiplication Named Algorithms Pivots, Ranks, Inverses and Determinants Two Geometries the Four Fundamental Spaces, Column Space Null Space, Row Space Left Null Space Computing the Four Fundamental Subspaces Summary of the Four Spaces Computing the Spaces Review, Complete Solutions.

Projection, Least Squares and Linear Regression Projection Revisited, Projection to Subspace Meaning of Projection Linear Regression. Eigenvalue Decomposition and Diagonalization Definition and Notation Examples of Eigenvalues and Eigenvectors Computing Eigenvalues and Finding Eigenvectors Properties Unit Circles and Ellipses Diagonalization Fibonacci Numbers Applications of Eigenvalues and Eigenvectors Special Matrices, Similarity and Algorithms, Real, Symmetric Matrices Hermitian Matrices Eigen Properties of Hermitian Matrices Markov Matrices Positive Definite Matrices Gram Matrix, Matrix Similarity ,Jordan Normal Forms Algorithms, Singular Value Decomposition What SVD Does How SVD Works Why SVD Is Important Fundamental Spaces and SVD

Reference Books

1 Linear algebra for computer science, M. THULASIDAS, 1 , ASIAN BOOKS Singapore-2021.

2 Discrete Mathematics and Its Applications, Kenneth H. Rosen, 7, McGraw-Hill, a business unit of The McGraw-Hill Companies-2012.

3 Linear Algebra, K. Hoffman and R. Kunze, 2, Prentice Hall of India-2005.

4 Linear Algebra Done Right, Axler, 2, Springer UTM 1997.

23MRCM02 - ADVANCED NUMERICAL ANALYSIS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM02	ADVANCED NUMERICAL ANALYSIS	ANA	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Compute the largest and small eigen values of a matrix using different methods.	3	PO1, PO3, PO5, PSO1, PSO2
CO2	Demonstrate the initial value problems, inverse interpolating and finite difference method.	3	PO1, PO3, PO5, PSO1, PSO2
CO3	Explain nature of the elliptic, parabolic and hyperbolic partial differential equations.	3	PO1, PO3, PO5, PSO1, PSO2
CO4	Apply collocation, least squares, and Rayleigh-Ritz methods to obtain the solution of initial valueproblems	4	PO1, PO3, PO5, PSO1, PSO2

Syllabus

Computations of Eigen Values of a Matrix Power method for dominant, sub-dominant and smallest eigen-values, Method of inflation, Jacobi, Givens and Householder methods for symmetric matrices, LR and QR methods. Initial Value Problems Multistep methods, their error analysis and stability analysis.

Inverse interpolation their developments and applications Finite Difference Review of finite difference operators finite difference methods. Elliptic PDE Five point formulae for Laplacian, replacement for Dirichlet and Neumanns boundary conditions, curved boundaries

Solution on a rectangular domain blocks tri-diagonal form and its solution using method of Hockney, condition of convergence. Parabolic PDE Concept of compatibility, convergence and stability, Explicit, full implicit, Crank Nicholson, du-Fort and Frankel scheme, ADI methods to solve two-dimensional equations with error analysis.

Hyperbolic PDE Solution of hyperbolic equations using FD, and Method of characteristics, Limitations and Error analysis. Weighted residual methods Collocation, least squares, Galerkins, Rayleigh Ritz methods and their compatibility.

Reference Books

1 Applied Numerical Analysis, Gerald, C. F. and Wheatly P. O, 6TH EDITION, Addison-Wesley Publishing,2002.

2 Numerical Solution of Partial Differential Equations, Smith, G. D, 2001, Oxford University Press..

3 Numerical Solution of Differential Equations, . Jain, M. K, 1991, John Wiley..

4 Applied Numerical Analysis, . Fausett, L. V, 2nd Ed.2007, Prentice Hall,.

5 Introduction to Numerical Analysis, Froberg, C. E, 2nd Ed. 2004, Addison Wesley..

23MRCM03 - MATHEMATICAL MODELLING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM03	MATHEMATICAL MODELLING	MML	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply difference equations to model and solve real life problems.	3	
CO2	Apply method of least squares for the best fitting linear and nonlinear models.	3	
CO3	Apply simulation modeling to Interpret real life problems.	3	
CO4	Apply mathematical modelling through differential equations	3	
CO5	Verify the solution of the equations using MATLAB	3	

Syllabus

Modeling Change, Proportionality, and Geometric Similarity: Modeling Change with DifferenceEquations, A Savings Certificate, Mortgaging a Home, Approximating Change with Difference Equations,Solutions to Dynamical Systems. Mathematical Models, Modeling Using Proportionality, Modeling UsingGeometric Similarity

To apply Method of least squares to Model Fitting: Fitting Models to Data Graphically, Analytic Methods of ModelFitting, Applying the Least-Squares Criterion, Choosing a Best Model, Vehicular Stopping Distance,Comparing the Criterion.Determining a Production Schedule. Simulation Modeling: SimulatingDeterministic Behavior, Area Under a Curve, Generating Random Numbers, Simulating ProbabilisticBehavior, Inventory Models

To Model and solve differential Equation:Population Growth, Graphical Solutionsof Autonomous Differential Equations, Drawing a Phase Line and Sketching Solution Curves, LogisticGrowth, Numerical Approximation Methods, Using Euler\\'s Method

To apply difference equation to model and solve a Savings Certificate Revisited,Separation of Variables, Newton\\'s Law of Cooling,Population Growth with Limited Resources, GraphicalSolutions of Autonomous Systems of First-Order Differential Equations, A Competitive Hunter Model, APredator--Prey Model.

To Apply MATLAB to validate the solutions of the mathematical equations

Reference Books

1 Mathematical Modelling, Kapur J. N, 1, New Age International Publishers, 2007.

2 Mathematical Modelling Models, Analysis and Applications, Banerjee Sandip, 1, CRC Press, Taylor &Francis Group, 2014.

3 A first course in mathematical modeling, Giordano, F. R., Fox W. P., and Horton S. B., 1, Brooks/Cole, 2014.

4 A concrete approach to mathematical modeling, Mesterton-Gibbons, M., 1, Addison-Wesley.

23MRCM04 - STOCHASTIC PROCESSES & OPTIMIZATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM04	STOCHASTIC PROCESSES & OPTIMIZATION	SPO	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Utilize the concept of Markov process and Poisson Process. solve real life applications	3	PO1, PSO1
CO2	Apply Queueing models and Demonstrate the concepts of Brownian motions and applications	3	PO1, PSO1
CO3	Construct LPP and solve LPP. Model and solve Transportation and Assignment problems.	3	PO1, PSO1
CO4	Apply Geometric programming and Ant-colony Optimization and PSO. Solve decision making techniques to solve real life problems.	3	PO1, PSO1

Syllabus

Discrete-Time Markov Models:Discrete-Time Markov Chains, Transient Distributions, Occupancy Times, Limiting Behavior, First-Passage Times. Poisson Processes:Poisson Processes, Superposition of Poisson Processes, Thinning of a Poisson Process, Compound Poisson Processes. Continuous-Time Markov Models:Continuous-Time Markov Chains, Transient Analysis: Uniformization, Occupancy Times, Limiting Behavior, First-Passage Times. Generalized Markov Models:Renewal Processes, Cumulative Processes, Semi-Markov Processes.

Queueing Models:Queueing Systems, Single-Station Queues, Birth and Death Queues. Brownian Motion:Standard Brownian Motion, Brownian Motion, First-Passage Times, Martingales and Semimartingales, Black Scholes Formula.

Introduction to LPP: Formulation of LP models, Graphical procedure of solution, Convex functions and their properties, Basic feasible solution, Optimal solution. Simplex method, Transportation Problems: VAM Method, Optimality Test, Degeneracy, Unbalanced Transportation problem, Assignment problems, Travelling salesman problem. Integer LPP - Branch and Bound Algorithm, Cutting Plane Algorithm.

Geometric Programming: Problems with one-degree of difficulty with positive coefficients, Geometric programming with constraints, Problems with positive and negative coefficients. Heuristic and Meta heuristics, Single solution vs. population-based, Parallel meta heuristics, Evolutionary algorithms, Nature-inspired meta heuristics, Genetic Algorithm, Ant-colony optimization, Particle swarm optimization, Simulated annealing.

Reference Books

1 Operations Research: An Introduction, Taha H A, 9 Edition, 2012, MacMillan Pub Co.

2 Optimization, Rao s s, 4 Edition, 2019, Wiley Eastern India.

3 Linear Programming, Hadley E, Paper Back, 2013, Addison-Wesley.

4 Operations Research: Principles and Practice, Ravindran, A., Phillips, D.T. and Solberg, J.J, 2 Edition, 2007, John Wiley and Sons.

5 Introduction to Operation Research, Hillier F.S. and Lieberman G.J, 9 Edition, 2018, Mc Graw Hill.

23MRCM05 - FUZZY MATHEMATICS AND ITS APPLICATIONS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM05	FUZZY MATHEMATICS AND ITS APPLICATIONS	FMAA	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts of fuzzy sets and fuzzy logic.	2	PO1
CO2	Apply the various operations on fuzzy sets and their properties.	3	PO1
CO3	Apply fuzzy logic to real-world problems and systems.	3	PO2
CO4	Apply fuzzy techniques in various fields such as control systems, decision-making, and pattern recognition.	3	PO2

Syllabus

Introduction to Fuzzy Sets and Systems Classical Sets vs. Fuzzy Sets Definition and examples of fuzzy sets Membership functions Basic operations on fuzzy sets Union, intersection, and complement T norms and T conorms Properties of fuzzy sets Convexity, normality, and support.

Fuzzy Relations and Fuzzy Logic Fuzzy Relations Definition and examples Operations on fuzzy relations Composition of fuzzy relations Fuzzy Logic Introduction to fuzzy propositions Fuzzy connectives Fuzzy inference rules.

Fuzzy Inference Systems Mamdani Fuzzy Models Structure of a fuzzy inference system Fuzzification and defuzzification methods Sugeno Fuzzy Models Linear and constant outputs Comparison between Mamdani and Sugeno models Applications in control systems Design of fuzzy controllers Real-world examples Applications of Fuzzy Mathematics Decision Making with Fuzzy Information Fuzzy decision-making models Multi-criteria decision making.

Fuzzy Pattern Recognition Fuzzy clustering algorithms Fuzzy C-means algorithm Fuzzy Systems in Engineering Fuzzy logic in control engineering Applications in industrial automation Fuzzy Optimization Introduction to fuzzy optimization problems Solution techniques Fuzzy Neural Networks Basics of neural networks Integration of fuzzy logic and neural networks.

Reference Books

1 Fuzzy Logic with Engineering Applications, Timothy J. Ross, 1, (1995), Wiley.

2 Introduction to Fuzzy Sets and Fuzzy Logic, M. Ganesh, 2, (2006), Prentice Hall India Learning Private Limited.

3 Fuzzy Sets, Uncertainty, and Information, George J. Klir and Tina A. Folger, 3, (1988), Prentice Hall.

4 Fuzzy Set Theory and Its Applications, H J Zimmermann, 1, (1985), Springer.

23MRCR01 - INTRODUCTION CLINICAL RESEARCH (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCR01	INTRODUCTION CLINICAL RESEARCH	ICR	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply ethical principles and guidelines to the design and conduct of clinical research studies: Demonstrate the ability to apply ethical principles and guidelines in the planning, execution, and evaluation of clinical research studies	3	
CO2	Apply statistical methods to analyze clinical research data and interpret the results: Utilize a range of statistical methods and tools to analyze data collected from clinical research studies, including techniques for data management, hypothesis testing, statistical modeling	3	
CO3	Apply knowledge of regulatory requirements to ensure compliance in clinical research and apply regulatory requirements and guidelines relevant to clinical research, including the review of legal and ethical standards set by regulatory bodies	3	
CO4	Apply effective communication skills to present clinical research findings to various stakeholders and develop and demonstrate effective communication skills for presenting clinical research findings to diverse audience	3	
CO5	Apply project management techniques to plan, execute, and monitor clinical research projects: and apply project management principles and techniques to oversee the planning, execution, and monitoring of clinical research projects	3	

Syllabus

Foundations of Clinical Research: Introduction to the history and evolution of clinical research, including early milestones and the development of modern practices. Key terminology and foundational concepts such as research design, study types, and objectives of clinical trials. Detailed exploration of different types of clinical research such as observational studies, randomized controlled trials, cohort studies, and case-control studies. An overview of the phases of clinical trials, including Phase 0 (exploratory studies), Phase I (safety), Phase II (efficacy), Phase III (confirmatory), and Phase IV (post-marketing). The objectives and methodologies of each phase and their role in the drug development process.

tudy Design and Methodology: In-depth examination of principles for designing clinical research studies, including the formulation of research questions, hypotheses, and study objectives. Overview of study designs such as randomized controlled trials, cohort studies, case-control studies, cross-sectional studies, and longitudinal studies. Methods for sampling populations, selecting appropriate samples, and ensuring representativeness.

Data Management and Analysis: Comprehensive review of data collection methods, including surveys, interviews, and data extraction from medical records. Methods for organizing, storing, and managing research data to ensure accuracy and reliability. Introduction to statistical analysis techniques, including descriptive statistics, inferential statistics, hypothesis testing, and multivariate analysis.

Ethical and Regulatory Considerations: Exploration of ethical principles guiding clinical research, including respect for persons, beneficence, and justice. Detailed review of the informed consent process, including how to obtain consent, ensure understanding, and maintain confidentiality. Examination of patient rights, including privacy protections and the right to withdraw from research.

Reference Books

1 Clinical Research: A Practical Guide, M. J. Fielding, S. G. Kelly, 2022, Wiley.

2 Introduction to Clinical Research, John I. Gallin, Frederick P. Ognibene, 2012, Elsevier.

3 Fundamentals of Clinical Trials, Lawrence M. Friedman, Curtis L. Meinert, 2015, Springer.

4 Designing Clinical Research, Stephen B. Hulley, Steven R. Cummings, 2013, Lippincott Williams & Wilkins.

5 Principles and Practice of Clinical Research, John I. Gallin, Frederick P. Ognibene, 2011, Academic Press.

23MRCR02 - CLINICAL TRAIL MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCR02	CLINICAL TRAIL MANAGEMENT	CTM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Identify key ethical considerations and regulatory frameworks guiding clinical trials	3	PO1, PO3, PSO2
CO2	Apply different types of clinical trial designs and their appropriate applications	3	PO1, PO3, PSO2
CO3	Apply the concepts of quality control and assurance processes to ensure trial integrity and compliance	3	PO4, PO5, PSO2
CO4	Apply statistical techniques for the analysis of clinical trial data	3	PO4, PO5, PSO2
CO5	Apply the concepts of medical practice in clinical trial experiments	3	PO4, PO5

Syllabus

Overview of Clinical Trials, Historical Development of Clinical Trials, Key Terminology in Clinical Research, Phases of Clinical Trials (Phase I-IV), Ethical Considerations and Principles (Belmont Report, Declaration of Helsinki), Regulatory Bodies and Guidelines (FDA, EMA, ICH-GCP), Informed Consent Process

Types of Clinical Trial Designs (Randomized Controlled Trials, Cohort Studies, Case-Control Studies), Developing a Clinical Trial Protocol, Objectives and Endpoints in Clinical Trials, Inclusion and Exclusion Criteria, Randomization and Blinding Methods, Sample Size Calculation and Power Analysis, Statistical Considerations in Trial Design, Budgeting and Financial Planning for Clinical Trials

Site Selection and Feasibility Studies, Recruitment Strategies and Patient Retention, Clinical Trial Operations and Project Management, Roles and Responsibilities of Clinical Trial Personnel (PI, CRC, CRA), Data Collection and Case Report Forms (CRFs), Electronic Data Capture (EDC) Systems, Adverse Event Reporting and Safety Monitoring, Quality Control and Quality Assurance Processes, Audits and Inspections

Data Management and Cleaning, Statistical Analysis Methods for Clinical Data, Interpretation of Results, Handling Missing Data, Preparation of Clinical Study Reports (CSRs), Publication and Dissemination of Trial Results, Regulatory Submissions and Documentation, Post-Marketing Surveillance and Pharmacovigilance, Ethical Considerations in Data Reporting

Fundamentals of Regulatory Affairs: Introduction to Regulatory Affairs, Regulatory Bodies and Legislation, Drug Development and Approval Process, Clinical Trials and Good Clinical Practice (GCP), Regulatory Submissions and Documentation, Quality Assurance and Compliance, Post-Market Surveillance and Pharmacovigilance, Advanced Topics in Regulatory Affairs: International Regulatory Affairs, Medical Devices and Combination Products, Biologics and Biosimilars, Regulatory Affairs in Emerging Markets, Orphan Drugs and Rare Diseases, Over-the-Counter (OTC) Products and Dietary Supplements, Advanced Regulatory Strategies and Project Management

Reference Books

1 Clinical Trials: Study Design, Endpoints, and Biomarkers, Tom Brody, 1st Edition, Academic Press.

2 Principles and Practice of Clinical Trial Management, Richard Chin, Menghis Bairu, 1st Edition, Academic Press.

3 Fundamentals of Clinical Trials, Lawrence M. Friedman, Curt D. Furberg, David L. DeMets, 5th Edition, Springer.

4 Clinical Trials: A Practical Approach, Stuart J. Pocock, 1st Edition, Wiley.

23MRCR03 - ETHICS IN CLINICAL RESEARCH (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCR03	ETHICS IN CLINICAL RESEARCH	ECR	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding Ethical Principles	2	PO1, PO2, PSO2
CO2	Informed Consent and Participant Rights: ensure the application of informed consent processes and uphold participant rights	2	PO1, PO2, PSO2
CO3	Ethical Conduct and Regulatory Compliance: apply ethical conduct standards and regulatory compliance requirements in professional practice.	2	PO1, PO2, PSO2
CO4	Addressing Ethical Challenges and Emerging Issues: tackle ethical challenges and emerging issues in the field by applying critical thinking and problem-solving skills	2	PO1, PO2, PSO2
CO5	Analyze and apply ethical principles such as autonomy, beneficence, non-maleficence, and justice to real-world case studies. Students will evaluate different scenarios, identify ethical issues, and propose solutions that uphold ethical standards in professional and research contexts.	3	PO1, PO2, PSO2

Syllabus

Foundations of Ethical Principles in Clinical Research This module introduces students to the fundamental ethical principles that underpin clinical research, emphasizing respect for persons, beneficence, and justice. It covers the historical development of ethical guidelines, exploring key documents like the Nuremberg Code, the Declaration of Helsinki, and the Belmont Report. Students will analyze significant historical cases, such as the Tuskegee Syphilis Study and the story of Henrietta Lacks, to understand the evolution of ethical standards and the importance of these principles in protecting research participants.

The focus of this module is on the critical process of informed consent and the safeguarding of participants\' rights. Students will learn about the essential components of informed consent, including how to effectively communicate with participants and obtain their voluntary participation. The module will also delve into the ethical considerations for vulnerable populations, ensuring students can identify and address the unique challenges faced by groups such as children, pregnant women, and economically disadvantaged individuals. Practical exercises and role-playing activities will help students gain confidence in applying these concepts.

In this module, students will explore the mechanisms that ensure the ethical conduct of clinical research, with a particular emphasis on regulatory compliance. They will study the roles and responsibilities of Institutional Review Boards (IRBs) and gain insights into the Good Clinical Practice (GCP) guidelines that govern clinical research worldwide. Key topics will include the ethical issues related to study design, data collection, and reporting, as well as the importance of maintaining transparency and integrity throughout the research process. Through practical sessions, students will learn how to prepare IRB submissions and navigate the regulatory landscape effectively.

The final module addresses the ethical challenges posed by new technologies and methodologies in clinical research. Students will explore emerging issues such as genetic research, biobanking, digital health, and telemedicine. They will be equipped with ethical decision-making frameworks and strategies to tackle complex scenarios, considering stakeholder perspectives and potential risks. Additionally, the module will look ahead to future trends in clinical research ethics, including the globalization of research and cross-cultural ethical considerations. Group projects and scenario-based exercises will enable students to apply their knowledge to real-world situations and anticipate future ethical dilemmas.

Reference Books

1 Ethics & Law of Clinical Research Trials, Dr. Ashok K Jain, 2023, Bharat Law House.

2 Ethical Issues In Clinical Research: A Practical Guide, Lo B, 2009, Lww Exclusive (Other)40.

3 Ethics in Clinical Research, Jane Barrett, 2006, Institute of Clinical Research.

4 Ethics and Regulation of Clinical Research, Robert J. Levine, 1988, Yale University Press.

23MRCR04 - PRECISION MEDICINE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCR04	PRECISION MEDICINE	PM	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the Principles of Precision Medicine	2	PO1, PO2, PSO1
CO2	Apply Genomic and Molecular Tools	3	PO1, PO2, PSO1
CO3	Integrate Bioinformatics in Precision Medicine	4	PO1, PO2, PSO1
CO4	Evaluate Ethical and Legal Issues and Discuss Clinical Applications	3	PO1, PO2, PSO1

Syllabus

Introduction to Precision Medicine: Definition, history, and evolution of precision medicine, Core principles and concepts

Genomics and Molecular Tools: Basics of human genetics and genomics, Next-generation sequencing technologies, Molecular diagnostics and biomarker discovery

Bioinformatics in Precision Medicine: Data analysis and interpretation in genomics, Computational tools for variant calling, annotation, and pathway analysis

Ethical, Legal, and Social Implications (ELSI): Ethical considerations in genetic testing and genomic research Privacy, consent, and regulatory frameworks, Clinical Applications of Precision Medicine: Oncology and cancer genomics, Pharmacogenomics and personalized therapeutics, Rare diseases and genetic disorders

Reference Books

1 Precision Medicine: A Guide to Genomics in Clinical Practice, Jeanette McCarthy and Bryce Mendelsohn, 2017, McGraw-Hill Education.

2 Genomic and Precision Medicine: Primary Care, George P. Patrinos and Huntington F. Willard, 2017, Academic Press.

3 Targeted Therapies in Oncology, Giuseppe Giaccone, Jean-Charles Soria, 2014, CRC Press.

4 Principles of Pharmacogenetics and Pharmacogenomics, Jean-Pierre Sommadossi and Francois Meyer, 2001, Wolters Kluwer Health.

23MRDM01M - FUNDAMENTALS OF DIGITAL MARKETING (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRDM01M	FUNDAMENTALS OF DIGITAL MARKETING	FDM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the key concepts of digital marketing to understand the digital customer	3	PO2, PSO1
CO2	Apply Digital marketing communication and channel mix	3	PO4, PSO1
CO3	Apply the key Components of digital marketing	3	PO6, PSO2
CO4	Analyse the Digital Business Present and future marketing concepts	4	PO8, PSO3

Syllabus

: Fundamental Need Scope of Digital marketing Traditional v. Digital Marketing the Opportunity of Digital Marketing Characteristics of Digital Marketing Implications of Digital Marketing Digital marketing framework delivering enhanced customer value market opportunity analysis and digital services development ASCOR digital marketing framework Application of digital marketing critical success factor for digital marketing

Designing the communications mix Marketing communications steps to creating marketing communication strategy developing communications messaging communication mix across digital channels. Introduction to digital marketing channels- Search marketing Display marketing social media marketing Partner direct content and platform based marketing channels

Website marketing Search engine marketing online marketing email marketing blog marketing social media marketing Audio video and interactive marketing mobile marketing public relations multimedia marketing.

The Indian view India digital spend overview India digital advertising spend key digital advertising trends in India India Digital marketing/tools landscape Digital marketing emerging trends and concepts Big data and IoT B2B and SMB SoLoMo. Career in Digital Marketing- Emerging opportunities for digital marketing professionals The changing role of CMO in Organisations Building a career in Digital marketing Top Digital marketing areas as career tracks Approaching a career in digital marketing.

Reference Books

1 Fundamentals of Digital marketing , Puneet Singh Bhatia, 3, 2019, Pearson Indian Publisher.

2 B2B Digital marketing , 2. Michael Miller , 2015, Pearson Indian Publishe.

3 Social Media Marketing Successfully For Beginners Create Successful Campaigns Gain More Fans And Boost Sales., F R Media, 2018, Pearson.

4 Digital Marketing, Kailash Chandra Upadyaya, 2016, Notion Press.

23MRDM02M - SOCIAL MEDIA MARKETING (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRDM02M	SOCIAL MEDIA MARKETING	SMM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental principles and concepts of social media marketing.	2	PO3
CO2	Understand different social media platforms to identify the most appropriate ones for specific marketing goals	2	PO3
CO3	Apply and manage social media campaigns using tools and techniques to optimize reach and engagement	3	PO3
CO4	Analyse the effectiveness of social media campaign	4	PO2

Syllabus

Overview of Social Media Marketing-Definition and significance-Evolution of social media-Differences between traditional and social media marketing. Social Media Platforms-Major platforms-Facebook, Twitter, Instagram, LinkedIn, YouTube, Pinterest. Social Media Ethics and Legal Considerations-Ethical issues in social media marketing-Legal regulations and compliance- Privacy and data protection.

Consumer Behavior in Social Media-Understanding social media users-Consumer decision-making process-Trends in social media usage- Platform demographics and user behaviors. Creating a Social Media Strategy- Setting goals and objectives-Identifying target audience-Selecting the right platforms.

Content Creation and Management- Content Marketing Fundamentals-Importance of content in social media-Types of content text, images, videos, infographics. Content Creation Techniques. Engagement Strategies-Building community and fostering engagement-Responding to comments and messages-Managing negative feedback-Influencer and Affiliate Marketing-Identifying and collaborating with influencers-Measuring influencer impact.

Social Media Analytics-Campaign Management and Optimization-Analytics and Reporting. Overview of analytics tools-Google Analytics, platform-specific analytics-Data collection and interpretation-Measuring ROI and campaign effectiveness

Reference Books

1 Digital Marketing, Seema Gupta, 3rd Edition 2022, McGraw Hill.

2 Social Media Marketing, Tracy L. Tuten, Michael R. Solomon, Bikramjit Rishi, 3rd Edition 2023, SAGE Publications India Pvt Ltd.

3 Social Media Marketing All-in-One For Dummies, Michelle Krasniak, Jan Zimmerman, Deborah Ng, 5th Edition 2021, For Dummies.

4 Social Media Marketing 2024: Mastering New Trends & Strategies for Online Success, Robert Hill, 2023, Independently Published.

23MRDM03M - SERACH ENGINE OPTIMIZATION (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRDM03M	SERACH ENGINE OPTIMIZATION	SEO	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To examine and explore the role and importance of search engine optimization in todays rapidly changing business environment	2	PO2
CO2	To know the key elements of a digital marketing strategy	2	PO2
CO3	Use optimization tools and metrics to analyze strategies, and effectively manage and improve SEO efforts.	4	PO2
CO4	To demonstrate advanced practical skills in search engine optimization	4	PO2

Syllabus

Search Engine Basics What Is a Search Engine Anatomy of a Search Engine Query interface Crawlers, spiders, and robots Databases Search algorithms Retrieval and ranking Characteristics of Search Classifications of Search Engines Primary search engines Secondary search engines Targeted search engines Putting Search Engines to Work for You Manipulating Search Engine Creating an SEO Plan Understanding Why You Need SEO Setting SEO Goals Creating Your SEO Plan Prioritizing pages Site assessment Finishing the plan Follow-up Understanding Organic SEO Achieving Organic SEO Web-site content Google Analytics Internal and external links User experience Site interactivity

Building Your Site for SEO Page elements Understanding Web-Site Optimization Domain-naming tips Understanding usability Components of an SEO-Keywords and Your Web Site The Importance of Keywords Picking the Right Keywords Taking Advantage of Organic keywords PayperClick and SEO How Pa-perClick Works Determining visitor value Putting pay-per-click to work Pay-per-Click Categories Service pay-per-click Keyword suggestion tools Choosing Effective Keywords Maximizing PayperClick Increasing Keyword Success Managing Keyword and PPC Campaigns Keyword Tools and services Tagging Your Web Site The Content Piece of the Puzzle Understanding the Role of Links and Linking

Optimizing Search Strategies Adding Your Site to Directories Pay for Inclusion Services Robots Spiders and Crawlers The Truth About SEO Spam Adding Social Media Optimization Automated Optimization

SEO Beyond the Launch Using Content Management Systems SEO Problems and solutions Content scraping Click fraud Analysing Success Analysing SEO Successes Managing SEO expectations www.it-ebooks.infoFind yourself Analysing web stats Competitive Analysis Conversion Analysis Analysing Server Logs

Reference Books

1 SEO-BIBLE , JERRY L LEDFORD, 2008, Wiley Publishing, Inc..

2 The Beginners guide search engine optimization , SpeckyGeek, 2020, SpeckyGeek.

3 A complete guide to getting started in SEO, SEJ Search engine journal , 2018, Alpha Brand Media.

4 Mastering Search Engine Optimization , E m egency, 2023, E m egency.

23MRDM04M - ARTIFICIAL INTELLIGENCE IN MARKETING (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRDM04M	ARTIFICIAL INTELLIGENCE IN MARKETING	AIM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of AI and machine learning in marketing.	2	PO2
CO2	Explore how AI is used for customer segmentation, targeting, and personalization	3	PO2
CO3	Analyze the role of AI in content creation, recommendation engines, and marketing automation. .	4	PO2
CO4	Discuss the ethical considerations and challenges of using AI in marketing.	4	PO2

Syllabus

Introduction to AI in Marketing Understanding AI and Machine Learning, The Marketing Landscape and AI Integration, Benefits and Challenges of AI in Marketing, Customer Segmentation with AI, Predicting Customer Behavior

AI-powered Marketing Automation Building Customer Profiles with AI, Personalization and Hyper-personalization, Chatbots and Virtual Assistants in Marketing, Content Creation with AI (e.g., AI-powered copywriting)

AI in Marketing Channels AI for Search Engine Optimization (SEO) and Marketingm Optimizing Paid Advertising with AI, AI-driven Social Media Marketing, Dynamic Pricing Strategies with AI.

The Future of AI in Marketing AI-powered Recommendation Engines, Optimizing Marketing Mix with AI, Emerging AI Trends and Applications, Ethical Considerations of AI in Marketing, The Future of Human-AI Collaboration

Reference Books

1 Marketing Artificial Intelligence: AI, Marketing, and the Future of Business, Paul Roetzer and Chris Kaput, 2022, Matt Holt.

2 Artificial Intelligence for Marketing Management, Thaichon Quach, 1, Routledge.

3 Artificial Intelligence for Marketing: Practical Applications , Christopher Penn, 1, Wiley.

4 "Artificial Intelligence in Marketing", Andreas Kaplan, 1st Edition (2019), Routledge.

23MREG01M - ETHICS OF ARTIFICIAL INTELLIGENCE (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MREG01M	ETHICS OF ARTIFICIAL INTELLIGENCE	EOAI	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To understand Ethics of AI & its Responsibilities	2	PO8
CO2	Awarness on Ethics of autonomous vehicles,Autonomous weapons and the digitalization of conflicts	2	PO8, PO9
CO3	Applying Human decisions in AI, and Addressing the value of privacy in information society,issues and challenges	3	PO4, PO9, PSO2
CO4	Implementing strategies and frameworks for policy and governance in AI	3	PO4, PSO2

Syllabus

Ethics AI & Responsibility,Introduction to Ethics of AI,Responsibility in the ethics of technology

Ethics of autonomous vehicles,Autonomous weapons and the digitalization of conflicts,Digital medicine,Sustainability and environmental impact,Cybersecurity and AI

Human decisions and AI, value of privacy in information society,issues and challenges

Governance & policies ,AI policies,Ethics of AI: a paradigmatic change

Reference Books

1 The Ethics of Artificial Intelligence for the Sustainable Development Goals, Luciano Floridi, Francesca Mazzi, 11 AUG 2023,2nd Edition, Oxford University Press.

2 The Oxford Handbook of Ethics of AI Get access Arrow, Markus D. Dubber (ed.), Frank Pasquale (ed.), 9 July 2023,2nd Edition, Oxford University Press .

3 The Ethics of Artificial Intelligence: An Introduction, Bernd Carsten Stahl, Doris Schroeder & Rowena Rodrigues , 02 November 2022, Springer, Cham.

4 AI Ethics, Mark Coeckelbergh, 10June 2020,2nd eition, The MIT Press.

23MREG02M - ARTIFICIAL INTELLIGENCE AND LAW (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MREG02M	ARTIFICIAL INTELLIGENCE AND LAW	AIAL	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction to AI and Legal Systems	2	PO1, PO2, PO3, PSO2
CO2	AI Tools and Legal Research	3	PO1, PO3, PO4, PSO1
CO3	Ethical and Regulatory Issues in AI and Law	3	PO1, PO2, PO3, PSO2
CO4	Practical Applications and Future Trends	4	PO1, PO2, PO3, PSO2

Syllabus

Practical Applications of AI in Legal Practice, AI in Legal Research and Document Review: Contract Management and Analysis: Litigation Support: Client Interaction and Services:

Integration and Implementation of AI in Legal Firms, Strategy for AI Adoption: Technology Infrastructure: Vendor Selection and Management: Ethical and Practical Considerations:

Emerging AI Technologies and Trends, Recent Advances in AI Technologies: AI in Emerging Legal Domains: Impact on Legal Education and Training: Future Challenges and Opportunities:

AI and Intellectual Property Law,Patents and AI,Copyright and Trade Secrets in AI,Future Trends and Innovations

Reference Books

1 "Artificial Intelligence and the Law: A New Frontier", Ugo Pagallo, 2013, Springer.

2 "Artificial Intelligence and Legal Liability", Tarek S. R. El-Gohary, 2020, Routledge.

3 "Artificial Intelligence and Legal Theory: The Revolution in Practice", David J. Ardia and R. Benjamin, 2021, Cambridge University Press.

4 "The Law of Artificial Intelligence", Frank Pasquale, 2019, Harvard University Press.

23MREG03M - DATA ETHICS, AI & RESPONSIBLE INNOVATION (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MREG03M	DATA ETHICS, AI & RESPONSIBLE INNOVATION	DEAIRI	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Data Privacy and Protection :Data privacy and protection are foundational elements of ethical data handling.	2	PO1, PO2, PO3, PSO2
CO2	Bias and Fairness in AI:Bias and fairness in AI pertain to the ethical challenge of ensuring that artificial intelligence systems operate equitably and do not reinforce or exacerbate existing biases	3	PO1, PO3, PO4, PSO1
CO3	Accountability and Transparency:Accountability and transparency are crucial for fostering trust and responsibility in AI systems.	3	PO1, PO2, PO3, PSO2
CO4	Ethical AI Design and Innovation:Ethical AI design and innovation focus on creating AI technologies that align with societal values and contribute positively to humanity.	4	PO1, PO2, PO3, PSO2

Syllabus

Introduction to Data Ethics and Privacy: Data Privacy Laws and Regulations, Consent and Transparency, Data Security Practices, Ethical Considerations in Data Collection:

Bias and Fairness in AI: Types of Bias,Detection and Mitigation Strategies,Fairness Metrics and Tools,Case Studies.

Accountability and Transparency in AI: Accountability Frameworks, Transparency Practices, Ethical AI Governance, Stakeholder Communication.

Ethical AI Design and Responsible Innovation: Principles of Ethical AI Design, Responsible Innovation,Impact Assessment, Future Trends and Challenges.

Reference Books

1 Ethics in AI: Navigating Data Privacy and Responsible Innovation", Dr. Timnit Gebru - AI ethics researcher and advocate.., 2024, MIT Press.

2 AI and Data Ethics: Principles, Challenges, and Solutions, Prof. Latanya Sweeney, 2026, Cambridge University Press.

3 Responsible AI Innovation: Ethical Frameworks and Practices, Dr. Ryan Calo, 2025, Oxford University Press.

4 The Future of Data Ethics: AI, Privacy, and Innovation, Dr. Latanya Sweeney, 2027, Springer.

23MREG04M - FAIRNESS, ACCOUNTABILITY & TRANSPARENCY IN AI (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MREG04M	FAIRNESS, ACCOUNTABILITY & TRANSPARENCY IN AI	FATAI	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Explain the concept of fairness in AI systems.	2	PO1, PO2, PO3, PSO1
CO2	Identify the stakeholders responsible for AI system outcomes	3	PO1, PO2, PO3, PSO2
CO3	Develop documentation and reporting practices that enhance transparency. Bloom\'s Taxonomy Level: Knowledge	3	PO1, PO2, PO3, PSO2
CO4	Simplify Critique AI systems from an ethical perspective, considering fairness, accountability, and transparency	4	PO1, PO2, PO3, PSO1

Syllabus

Introduction to FAT in AI,Course Overview and Importance of FAT in AI,Course objectives and structure o Historical context and significance of FAT ,Overview of key issues and case studies,

Understanding Fairness in AI,Definitions and concepts of fairness,Types of biases in AI systems (data, algorithmic, user),Fairness Metrics,Statistical parity,Equalized odds,Predictive parity,Demographic parity

Accountability in AI,Definition and significance,Historical context and key issues,Overview of relevant laws and regulations (e.g., GDPR, CCPA),Compliance and governance,o Accountability frameworks and models,Stakeholders in AI development (developers, organizations, users),o Ethical responsibilities and professional conduct,

Transparency in AI,Definition and importance of transparency,Key challenges,Difference between interpretability and explainability,Techniques for creating interpretable models (e.g., LIME, SHAP),Model cards,Data sheets for datasets,Algorithmic transparency reports,Effective ways to communicate AI decisions to users,Design of user interfaces that enhance transparency

Reference Books

1. Fairness and Machine Learning: Limitations and Opportunities, ,Solon Barocas, Moritz Hardt, and Arvind Narayanan, 2019, The MIT Press.
2. The Ethics of AI, Matthew Liao , 2020, Oxford University Press.
3. Interpretable Machine Learning: A Guide for Making Black Box Models Explainable, Christoph Molnar, 2022, Christoph Molnar self published.
4. The Black Box Society: The Secret Algorithms That Control Money and Information, Frank Pasquale, 2015, Harvard University Press.
5. Ethics of Artificial Intelligence and Robotics, Vincent C. M?ller , 2020, Oxford University Press.

23MRFA01M - FOUNDATIONS AND APPLICATIONS OF FINANCIAL TECHNOLOGY (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFA01M	FOUNDATIONS AND APPLICATIONS OF FINANCIAL TECHNOLOGY	AFT	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the historical context and evolution of financial technology.	2	PO2
CO2	Understand key technologies driving the FinTech revolution.	2	PO3
CO3	Understand the impact of FinTech on traditional financial services.	2	PO6
CO4	Develop practical skills through case studies and project-based learning.	2	PO6

Syllabus

Introduction to Financial Technology, History and Evolution of FinTech Overview of the financial services industry, Key drivers of FinTech innovation, Blockchain and Cryptocurrencies: Introduction to blockchain technology, Cryptocurrencies: Bitcoin, Ethereum, and others. Applications of blockchain in financial services and Regulatory and security issues

Digital Payments and Remittances: Evolution of payment systems, Mobile payments and digital wallets, Cross-border remittances and Case studies: PayPal, Venmo, and others Peer-to-Peer Lending and Crowdfunding, Overview of peer-to-peer (P2P) lending, Crowdfunding platforms and models Risk management and regulatory challenges and Case studies: LendingClub, Kickstarter, and others

Robo-Advisors and Wealth Management: Introduction to robo-advisors, Algorithms and AI in wealth management, Benefits and limitations of automated financial advice and Case studies: Betterment, Wealth front, and others. InsurTech: Innovation in Insurance, Overview of InsurTech Data analytics and AI in insurance, Personalized insurance products and Case studies: Lemonade, Oscar Health, and others

RegTech and Compliance: Introduction to RegTech, Technologies for regulatory compliance, Anti-money laundering (AML) and Know Your Customer (KYC) solutions and Case studies: Onfido, ComplyAdvantage, and others Cybersecurity in Financial Services: Importance of cybersecurity in FinTech Common threats and vulnerabilities, Security protocols and technologies and Case studies: Equifax breach, other relevant incidents

Reference Books

1. The Financial Technology Handbook for Investors, Entrepreneurs, and Visionaries, usanne Chishti and Janos Barberis, 1st Edition (2016), Wiley.
2. A Non-Technical Introduction in 25 Steps, Daniel Drescher, 1st Edition (2017), Apress.
3. Digital Finance: Big Data, Startups, and the Future of Financial Services, Baxter Hines, 1st Edition (2020), Wiley.
4. Handbook of Blockchain, Digital Finance, and Inclusion, Volume 1: Cryptocurrency, FinTech, InsurTech, and Regulation, David Lee Kuo Chuen and Robert Deng, 1st Edition (2017), Academic Press.

23MRFA02M - DECENTRALISED FINANCE: THE FUTURE OF FINANCE (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFA02M	DECENTRALISED FINANCE: THE FUTURE OF FINANCE	DFFF	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental principles and technologies underlying DeFi.	2	PO1
CO2	Examine the key components and technologies behind DeFi.	3	PO2
CO3	Analyze the risks, challenges, and opportunities associated with DeFi.	3	PO3
CO4	Analyze the regulatory and legal aspects of DeFi.	4	PO5

Syllabus

Introduction to Decentralized Finance: Overview of traditional finance vs. decentralized finance, History and evolution of DeFi, Key components and terminology. Blockchain Technology and Cryptocurrencies: Fundamentals of blockchain technology, Overview of major cryptocurrencies (Bitcoin, Ethereum, etc) , Role of blockchain in DeFi.

Components of DeFi: Cryptocurrencies and Tokens, Bitcoin, Ethereum, and Altcoins, Introduction to Smart Contracts: Definition and Importance of Smart Contracts, Smart Contracts Work.

Decentralized Exchanges (DEXs), Functioning of DEXs (e.g., Uni swap, Sushi Swap), Lending and Borrowing Platforms, Aave, Compound, Yield Farming and Liquidity Mining, Stable coins and Synthetic Assets, Types and Uses of Stable coins. DeFi Security and Risk Management: Security Challenges in DeFi, Common Vulnerabilities and Hacks, Risk Management Strategies.

Regulatory and Legal Aspects of DeFi: Overview of Global Regulatory Landscape, Regulatory Frameworks for Cryptocurrencies, Legal Challenges and Considerations, Future of DeFi Regulation, Future Trends and Innovations: Emerging Trends in DeFi, Potential Disruptions in Traditional Finance. Predictions and Future Directions.

Reference Books

1 DeFi and the Future of Finance, Campbell R. Harvey, Ashwin Ramachandran, and Joey Santoro, 1st Edition, 2021, Wiley.

2 Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, rvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, 1st Edition, 2016, Princeton University Press.

3 Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications", Imran Bashir, 2nd Edition, 2020, Packt Publishing.

4 The Bitcoin Standard: The Decentralized Alternative to Central Banking, Saifedean Ammous, 1st Edition, 2018, Wiley.

23MRFA03M - FINTECH INNOVATIONS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFA03M	FINTECH INNOVATIONS	FIV	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fintech landscape including its history evolution and impact on the financial industry.	2	PO1
CO2	Understand the role of artificial intelligence (AI) and machine learning (ML) in fintech	2	PO2, PO10
CO3	Understand blockchain technology and its applications, with a particular focus on cryptocurrencies and their role in the fintech sector.	2	PO2, PO10
CO4	Understand the innovations in digital payments and lending, new business models and technologies transforming these areas.	2	PO2, PO10

Syllabus

Introduction to Fintech: History and Evolution of Fintech Key Drivers of Fintech Innovation Major Fintech Segments (Payments, Lending, Wealth Management, Insurtech, Regtech) Fintech Ecosystem (Startups, Incumbents, Regulators) Key Technologies in Fintech (Blockchain, AI, Big Data, APIs) Case Studies of Successful Fintech Companies

AI and Machine Learning in Fintech: Introduction to AI and Machine Learning Applications of AI in Financial Services (Robo-Advisors, Fraud Detection, Credit Scoring) Natural Language Processing (NLP) and Chatbots in Fintech Predictive Analytics and Customer Insights Algorithmic Trading and Wealth Management Ethical Considerations and Bias in AI. Case Studies of AI in Fintech

Blockchain and Cryptocurrencies: Fundamentals of Blockchain Technology Consensus Mechanisms (Proof of Work, Proof of Stake) Cryptocurrencies (Bitcoin, Ethereum, Altcoins) Initial Coin Offerings (ICOs) and Tokenization Decentralized Finance (DeFi) Regulatory and Compliance Issues in Cryptocurrencies Security and Risk Management in Blockchain

Digital Payments and Lending: Evolution of Digital Payments (Mobile Payments, E-wallets) Real-time Payments and Cross-border Transfers Peer-to-Peer (P2P) Lending Platforms Crowdfunding and Alternative Lending Models Digital Banking and Neobanks Risk anagement and Fraud Prevention in Digital Payments Regulatory Considerations in Digital Payments and Lending

Reference Books

1 FinTech Innovation: From Robo-Advisors to Goal Based Investing and Gamification, Paolo Sironi, First, Wiley.

2 FinTech: The New DNA of Financial Services, Pranay Gupta, T. Mandy Tham, and Raymond Yeung, First, Walter de Gruyter GmbH.

3 FinTech Revolution: Universal Inclusion in the New Financial Ecosystem, Sofie Blakstad and Robert Allen, First, Palgrave Macmillan.

4 Blockchain and FinTech: A Comprehensive Guide, Spiros Margaris, Richard Kastelein, and Alexis Nicolau, First, Palgrave Macmillan.

5 The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, Susanne Chishti and Janos Barberis, First, Wiley.

23MRFA04M - USING MACHINE LEARNING IN TRADING AND FINANCE (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFA04M	USING MACHINE LEARNING IN TRADING AND FINANCE	ML	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Able to apply TensorFlow to write small programs.	3	PO2
CO2	Able to Analyse the data using TensorFlow and Keras.	4	PO3
CO3	Able to Analyse the data using Momentum Trading using ML algorithms.	4	PO3, PSO2
CO4	Able to develop a Pair Trading Strategy.	4	PO3, PSO3

Syllabus

Introduction to Quantitative Trading and Machine Learning, Basic Trading Strategy Entries and Exits Endogenous Exogenous, Trading Strategy Building a Trading Model, Advanced Concepts in Trading Strategies, Welcome to Using Machine Learning in Trading and Finance,Introduction to TensorFlow, Introduction to TensorFlow, TensorFlow API Hierarchy, Components of tensorflow Tensors and Variables, Getting Started with Google Cloud Platform and Qwiklabs, Lab Intro Writing low-level TensorFlow programs, Working in-memory and with files, Training on Large Datasets with tf.data API, Getting the data ready for model training.

Training Neural Networks with TensorFlow2 and keras, Activation functions, Activation functions, itfalls to avoid in Backpropagation, Neural Networks with Keras Sequential API, Serving models in the cloud, Lab Intro to Keras Sequential API, Neural Networks with Keras Functional API, Regularization Basics, Regularization: L1, L2, and Early Stopping, Dropout, Lab Intro to Keras Functional API.

Build a Pair Trading Strategy Prediction Model, Introduction to Pair Trading, Picking Pairs, Picking Pairs with Clustering, How to implement a Pair Trading Strategy, Evaluate Results of a Pair Trade, Backtesting and Avoiding Overfitting, Next Steps for Improvements to your Pairs Strategy, Lab Intro to Pairs Trading, Kalman Filter Introduction and Trading Applications. Co4: To develop a Pair Trading Strategy.

Build a Pair Trading Strategy Prediction Model, Introduction to Pair Trading, Picking Pairs, Picking Pairs with Clustering, How to implement a Pair Trading Strategy, Evaluate Results of a Pair Trade, Backtesting and Avoiding Overfitting, Next Steps for Improvements to your Pairs Strategy, Lab Intro to Pairs Trading, Kalman Filter Introduction and Trading Applications. Co4: To develop a Pair Trading Strategy.

Reference Books

1 Machine Learning for Finance , Saurav Singla, 1, BPB Publications.

2 Stock Market Prediction and Efficiency Analysis using Recurrent Neural Network, Joish Bosco, 1, University.

3 Machine Learning in Finance: From Theory to Practice, Mathew F Dixon, 1, Springer.

4 MACHINE LEARNING IN FINANCE: RISK MANAGEMENT, TRADING, AND FRAUD DETECTION (, Dr. Aman Gupta, Dr. Hafizah, Subharun Pal, Syamsu Rijal, 1, Xoffencer International Publication.

23MRFM01 - FILM AESTHETICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFM01	FILM AESTHETICS	FAS	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze the formal elements of film (such as cinematography, mise-en-sc?ne, editing, sound, and narrative structure) to understand how they contribute to the overall aesthetic experience.	4	PO8
CO2	Evaluate different film movements and styles, assessing their historical and cultural significance and their impact on contemporary cinema.	5	PO7
CO3	Apply critical and theoretical concepts to the analysis of films, demonstrating an understanding of aesthetic principles and their practical implications in filmmaking.	3	PO6

Syllabus

Introduction to Film Aesthetics: Defining aesthetics and its importance in film. Cinematography: The art of visual storytelling, including composition, lighting, and camera movement. Mise-en-sc?ne: The arrangement of everything that appears in the frame, including settings, props, and actors. Editing: The techniques and impact of cutting, continuity editing, montage, and rhythm. Sound: The role of sound design, music, and dialogue in enhancing the filmic experience.Film Analysis Exercise: Watch a selected film and analyze its use of cinematography, mise-en-sc?ne, editing, and sound.

Classical Hollywood Cinema: Narrative and stylistic conventions. European Art Cinema: Characteristics and key directors. Film Noir: Visual and thematic elements. New Wave Cinemas: French New Wave, New Hollywood, and other global movements. Experimental and Avant-Garde Film: Breaking the norms of narrative and form.Movement Analysis Exercise: Research and present on a specific film movement, highlighting its key characteristics and influence. Film Screening and Discussion: Watch a film from a notable movement and discuss its aesthetic and thematic contributions.

Classical Film Theory: Theoretical foundations laid by early film theorists. Contemporary Film Theory: Modern approaches and their relevanalysis. Psychce to current film anoanalytic Theory: Understanding the psychological underpinnings of film aesthetics. Feminist Film Theory: Examining gender representations and their aesthetic implications. Postmodernism in Film: Characteristics and examples of postmodern aesthetics.Theoretical Application Essay: Write an essay applying a specific theoretical framework to a film of choice. Group Debate: Debate the merits and limitations of different film theories in understanding film aesthetics.

Reference Books

1 Film art: An introduction , Bordwell, D., & Thompson, K., 2019, McGraw-Hill Education.

2 The cinema book, Cook, P., 2018, Bloomsbury Academic..

3 How to read a film: Movies, media, and beyond, Monaco, J. , 2009, Oxford University Press..

4 Film theory: An introduction., Stam, R. , 2000, Wiley-Blackwell.

23MRFM02 - SCREEN WRITING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFM02	SCREEN WRITING	SWT	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Develop compelling narratives and well-structured scripts by applying key principles of screenwriting, including plot, character development, and dialogue.	3	PO9
CO2	Analyze and critique screenplays to identify strengths and areas for improvement, utilizing industry-standard formatting and storytelling techniques.	3	PO8
CO3	Create original screenplays that demonstrate an understanding of various genres, styles, and audience expectations.	3	PO6

Syllabus

Introduction to Screenwriting: Understanding the role and responsibilities of a screenwriter. Story Structure: The Three-Act Structure, plot points, and narrative arcs. Character Development: Crafting multidimensional characters, including protagonists, antagonists, and supporting roles. Creating Conflict: Techniques for building tension and driving the narrative forward. Screenplay Formatting: Industry-standard script formatting and conventions.

Writing Effective Dialogue: Crafting authentic and compelling dialogue. Scene Construction: Building effective scenes that advance the plot and develop characters. Genre and Style: Understanding different genres and writing styles. Visual Storytelling: Using descriptions and actions to convey visual elements and emotions. Revision Techniques: Strategies for revising and improving your screenplay.

Theme and Subtext: Incorporating deeper meanings and themes into your screenplay. Writing for Different Media: Adapting screenwriting techniques for television, web series, and other formats. Collaborative Writing: Working with directors, producers, and other writers. Pitching and Selling Scripts: Techniques for pitching your screenplay and navigating the business side of screenwriting. Final Draft and Polishing: Preparing your screenplay for submission.

Reference Books

1 Screenplay: The foundations of screenwriting., Field, S. , 2005, Delta.

2 Story: Substance, structure, style, and the principles of screenwriting., McKee, R., 1997, ReganBooks..

3 Writing screenplays that sell , Snyder, B. , 2005, Michael Wiese Productions..

4 The Screenwriter's Bible: A complete guide to writing, formatting, and selling your script, Trottier, D., 2014, Silman-James Press..

23MRFM03 - CINEMATIC LIGHTING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFM03	CINEMATIC LIGHTING	CML	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of lighting in cinematography	2	PO1
CO2	Develop an understanding of the historical evolution and trends in cinematic lighting.	2	PO2, PO3
CO3	Apply various lighting setups to achieve desired aesthetic effects in different scenes.	3	PO3

Syllabus

Introduction to Cinematic Lighting: The role of lighting in film and media. Basic Lighting Concepts: Understanding light properties, color temperature, and intensity. Lighting Equipment: Overview of different types of lights (e.g., tungsten, LED, HMI) and accessories (e.g., diffusers, gels). Three-Point Lighting: Techniques for key, fill, and backlighting. Natural vs. Artificial Light: Techniques for utilizing and controlling natural light, as well as integrating artificial lighting.

Creative Lighting Techniques: High-key vs. low-key lighting, chiaroscuro, and practical lighting. Mood and Atmosphere: Using lighting to create specific moods and atmospheres. Color in Lighting: Understanding color theory and using gels and filters to achieve desired color effects. Lighting for Different Genres: Tailoring lighting techniques to suit genres such as horror, romance, and action. Location Lighting: Techniques for lighting on location, dealing with constraints and opportunities.

Lighting Design for Characters: Enhancing character features and emotions through lighting. Dynamic Lighting: Techniques for creating movement and change within lighting setups. Special Effects Lighting: Using lighting to create special effects (e.g., firelight, lightning). Cinematic Lighting Plans: Developing comprehensive lighting plans for scenes and sequences. Evaluating and Refining Lighting: Techniques for evaluating lighting effectiveness and making adjustments.

Reference Books

1 Cinematography: Theory and Practice , Brown, Blain, 2017 , Routledge.

2 Film Lighting: Talks with Hollywood's Cinematographers and Gaffers , Malkiewicz, Kris. , 2013, Touchstone.

3 Set Lighting Technician's Handbook: Film Lighting Equipment, Practice, and Electrical Distribution, Box, Harry, & Walters, Christopher, 2018, Routledge.

4 Lighting for Cinematography: A Practical Guide to the Art and Craft of Lighting for the Moving Image. , Landau, David, & Pflug, Masha , 2014 , Bloomsbury Academic .

23MRFM04 - SOUND DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFM04	SOUND DESIGN	SDS	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze the principles of sound design and their application in various media, including film, television, and interactive media.	4	PO6
CO2	Create and manipulate audio elements using industry-standard tools and techniques to enhance storytelling and audience engagement.	3	PO7
CO3	Evaluate the effectiveness of sound design in media projects, providing constructive feedback and incorporating revisions to improve the overall soundscape.	5	PO8

Syllabus

Introduction to Sound Design: The role and importance of sound in media. Basic Audio Theory: Understanding sound waves, frequency, amplitude, and timbre. Microphones and Recording Techniques: Types of microphones, placement, and techniques for capturing high-quality audio. Field Recording: Capturing natural and environmental sounds. Digital Audio Workstations (DAWs): Introduction to popular software for sound editing and mixing.

Sound Editing Techniques: Cutting, trimming, crossfading, and time-stretching. Sound Restoration and Noise Reduction: Cleaning up audio recordings. Creating Sound Effects: Foley, synthesis, sampling, and using sound libraries. Ambient and Environmental Sounds: Designing background sounds to enhance scenes. Sound Mixing Principles: Balancing audio elements, EQ, dynamics, and spatial effects.

Surround Sound and Immersive Audio: Techniques for creating immersive sound experiences. Dialogue and Voiceover: Recording, editing, and mixing dialogue and voice performances. Audio Effects and Processing: Reverb, delay, modulation, and other creative effects. Finalizing Sound Mixes: Mastering, exporting, and delivering sound for various platforms. Sound Design for Interactive Media: Implementing sound in video games, VR, and interactive installations.

Reference Books

1 Sound for film and television , Holman, T., 2010, Focal Press..

2 Sound design: The expressive power of music, voice, and sound effects in cinema. , Sonnenschein, D. , 2001, Michael Wiese Productions..

3 Practical art of motion picture sound , Yewdall, D., 2012, Focal Press..

4 The sound effects Bible: How to create and record Hollywood style sound effects. , Viers, R. , 2012, Michael Wiese Productions. .

23MRFT01 - INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFT01	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY	IFST	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understand the basic principles of food science and technology	2	PO1, PO6, PO8
CO2	Determine the structure, composition, nutritional quality and postharvest changes of various plant foods.	3	PO1, PO6, PO8
CO3	Determine the structure and composition of various animal foods	3	PO1, PO6, PO8, PO10
CO4	Discover about various dairy products	3	PO1, PO6, PO8
CO5	Demonstrate use various basic food processing techniques with an aim to preserve the foods	3	PO1, PO6, PO8

Syllabus

historical evolution of food processing technology. Cereals and millets Structure and composition, properties and nutritional attributes of rice, wheat, maize, barley, millet and oats, malting, gelatinization of starch, types of browning Maillard & caramelization, rice parboiling of rice advantages and disadvantages.

Structure and composition of pulses, toxic constituents in pulses, processing of pulses soaking, germination, decortications, cooking and fermentation. Fats and Oils-classification of lipids, types of fatty acids saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, and hydrogenation. Rancidity Types- hydrolytic and oxidative rancidity and its prevention.

Fruits and Vegetables-Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fiber. Post-harvest changes in fruits and vegetables Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

Introduction to poultry and dairy sectors

Analzing the various characteristics of foods

Reference Books

1 Food Science , Bawa. A.S, O.P Chauhan et al, 2013, New India Publishing agency.

2 Food Science, Roday,S, 2011, oxford publication.

3 Food science, Srilakshmi, 2002, New Age Publishers.

4 Outlines of Dairy Technology, De Sukumar, 2007, oxford publication press.

23MRFT02 - FOOD ANALYSIS AND QUALITY ASSURANCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFT02	FOOD ANALYSIS AND QUALITY ASSURANCE	FAQA	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the analytical aspects of foods in quality and regulatory perspective.	2	PO1, PO5, PO9, PSO1
CO2	Apply the analytical methods for chemical and nutritional properties of foods.	3	PO1, PO5, PO9, PSO1
CO3	Apply the analytical methods for thermal and rheological properties of foods.	3	PO1, PO5, PO9, PSO1
CO4	Apply sensory and microbiological analysis on different processed foods.	3	PO1, PO5, PO9, PSO1
CO5	Analyze the project on Quality assurance	4	PO1, PO5, PO9, PSO1

Syllabus

Introduction to Food Analysis, Importance of various food components, purpose, sampling requirements. Quality different aspects of food analysis, Properties, parameters, methods, techniques. Regulatory aspects involved in the food analysis

Chemical and Physico-Chemical analysis of foods, Chemical analysis such as carbohydrate, protein, fat, mineral content analysis. Study on different physical properties such as colour, size, shape, composition and interfacial properties.

Different Thermal and Rheological Properties. Thermal properties such as transition (glass and melting) and degradation temperatures, thermal conductivity, specific heat and thermal diffusivity of different foods. Different rheological properties such as flow properties, studies on shear stress and shear rate in different foods.

Study on microbial effect in different types of foods. Study on microbial diseases transmitted through foods. Study of different sensory parameters, study on advanced sensory software tools. Study on advanced microbiological techniques.

Evaluate the project on Quality analysis including Practical Safety evaluation of foods for heavy metal content and pesticides residue, Analyse the water activity in different foods, Analyse the texture of different foods, Analyse the quality parameters of water, Evaluate the thermal properties of different foods, Analyse the flow properties of different foods, Evaluate the microbial quality of selected food products.

Reference Books

1 Handbook of Food Analysis Instruments , Semih Otles , 1st Edition, 2009, CRC Press.

2 Instrumental Methods in Food and Beverage Analysis, David L. B. Wetzel, George Charalambous, 1st Edition, 1998 , Elsevier.

3 Vitamin Analysis For The Health And Food Sciences, Ronald Ray Eitenmiller, Lin Ye, W. O. Landen, 2nd Edition, 2007, CRC Press.

4 Methods of Analysis of Food Components and Additives, Semih Otles, 2nd Edition, 2012, CRC Press.

23MRFT03 - FOOD SAFETY AND REGULATIONS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFT03	FOOD SAFETY AND REGULATIONS	FSR	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the overall concept of food safety , hazards	2	
CO2	Apply the food safety regulations such as ISO and safety management systems like HACCP	3	
CO3	Apply food safety measures to hazard control	3	
CO4	Apply food safety management systems to hazard control	3	

Syllabus

Definitions, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods. Physical and Chemical Food Hazards Introduction, Physical Hazards with common examples, Chemical HazardsImpact on health, Control measures

Biological Food Hazards Introduction, Indicator Organisms, Food borne pathogens: bacteria, viruses, eukaryotes, Seafood and Shell fish poisoning, Mycotoxins.

Hazard Management Need, Control of parameters, Temperature control, Food storage, Product design. Hygiene and Sanitation in Food Service Establishments Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste disposal, Pest and Rodent Control, Personal hygiene, Food Safety Measures.

Food Safety Management Tools Concept, Prerequisites- GHPs ,GMPs, SSOPs etc, HACCP, ISO, TQM concept and need for quality, components of TQM, Kaizen Risk analysis, Accreditation and Auditing. Microbiological Hazards Microbiological standards and limitsMicrobiological Assessment and categories of food based on microbial quality, Sampling, Basic steps in detection of food borne pathogens, Water analysis, Assessment of Surface Sanitation and Personal Hygiene

Reference Books

1 The microbiological safety and quality of food, Barbara M. Lund, Tony C. Baird-Parker, G. W. Gould, 2000, Aspen Publishers, Gaithersburg, Md., .

2 Chemistry and Safety of Acrylamide in Food, Margareta T?rnqvist (auth.), Mendel Friedman, Don, 2005, MottramSpringer Science & Business Media,.

3 Food safety handbook, Ronald H. Schmidt, Gary E. Rodrick, 2003, Global Publishing House.

4 HACCP, Sara E. Mortimore, Carol Wallace, Christos Cassianos, Online, 2001, Cambridge University Press.

5 Food Plant Sanitation- Design, Maintenance, and Good Manufacturing Practices, Michael M Cramer, 2013, Taylor &; Francis Group.

23MRFT04 - FOOD ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFT04	FOOD ENGINEERING	FEG	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand unit operations and plant design.	2	
CO2	Apply principles of fluid flow to food processing	3	
CO3	Apply principles of heat transfer.to food processing	3	
CO4	Apply principles of phase change to food processing	3	
CO5	Conduct Food Engineering Experiments to food processing	3	

Syllabus

Unit Operations and Food Plant Design: Concept of Unit operation. Units and dimensions, Unit conversions, dimensional analysis. Mass and Energy Balance. Important considerations for designing of food plants, types of layouts. Equipment used in food industry.

Fluid Flowing Food Processing, Liquid Transport System

Heating and Cooling Systems Heating thermal properties of food, modes of heat transfer, application of steady state heat transfer, superheating. Heating equipment heat exchangers types, design characteristics. Refrigeration Concept, selection of a refrigerant, refrigeration cycle, sub cooling,

Steam, Evaporation and Dehydration: Steam Generation, construction and functions of fire tube and water tube boilers. Evaporations types, design of single effect evaporators, basic drying process, moisture content on wet basis and dry basis, design of dehydration systems

Reference Books

1. Introduction to Food Engineering, Paul Singh, R. and Dennis R. Heldman. 2009. Introduction to Food Engineering, 4, Academic press, New York, USA..
2. Unit Operations in Food Engineering., Albert Ibarz and Gustavo V. Barbosa,C?novas. 2003. Unit Operations in Food Engineering., 2003, CRC Press LLC, Florida.
3. Food Process Engineering and Technology., Zeki Berk. 2009. Food Process Engineering and Technology., 2009, Academic press, New York, USA..
4. Unit operations in Food Processing., R.L. Earle. 1983. Unit operations in Food Processing., 1983, Pergamon Press, New York, USA..

23MRGD01 - INTRODUCTION TO GRAPHIC DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRGD01	INTRODUCTION TO GRAPHIC DESIGN	IGD	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Students will be able to list and describe the fundamental principles and elements of graphic design.	2	PO1
CO2	Understand Students will be able to explain the significance of typography, color theory, and layout in creating effective designs	2	PO2
CO3	Apply Students will be able to apply basic design principles to create visually appealing and functional graphic design projects using industry-standard software.	3	PO3
CO4	Articulate Students will be able to analyze and critique the effectiveness of various graphic designs, identifying strengths and areas for improvement based on design principles	3	PO4
CO5	Analyze Students will be able to develop a comprehensive graphic design project, incorporating advanced techniques and original concepts to produce a professional-quality	4	PO5

Syllabus

Principles of Design: Balance, Contrast, Emphasis, Movement, Proportion, Rhythm, Unity

Exploration of typography and color theory as essential components of effective design.Typography: Typefaces, Fonts, Hierarchy, Legibility, Pairing

Understanding the arrangement of visual elements to create effective compositions.

Software Basics: Adobe Photoshop, Illustrator, InDesign,Digital Illustration: Vector vs. Raster Graphics, Pen Tool, Brush Tool

Portfolio Basics: Selecting Works, Presentation Techniques, Branding Critique Methods: Self-Critique, Peer Review, Professional Feedback

Reference Books

1 "Graphic Design: The New Basics", by Ellen Lupton and Jennifer Cole Phillips, 1st, by Ellen Lupton and Jennifer Cole Phillips.

2 "Thinking with Type" , by Ellen Lupton Description: A comprehensive gu, 2nd, by Ellen Lupton Description: A comprehensive gu.

3 "The Elements of Graphic Design" , by Alex W. White, 1st, by Alex W. White.

4 "Color: A Workshop for Artists and Designers", by David Hornung, 2nd, by David Hornung.

23MRGD02 - TYPOGRAPHY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRGD02	TYPOGRAPHY	TPY	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the graphic desgn composition principles	2	PO1
CO2	Understand the types of typography utilities	2	PO2
CO3	Apply the Principles of Typography such as Typographic hierarchy ,Grid systems and layout principles ,Readability and legibility considerations in students projects	3	PO3

Syllabus

Type setting Techniques as Kerning, tracking, and leading Alignment and justification Optical adjustments vs. mechanical adjustments and also Typography and Branding Creating as typographic identity case studies of successful brand typography ,and also experience the Experimental Typography as Typographic art and installations

The Cultural influences on typography in different languages and also scripts of Ethical considerations in typography

The Typesetting Techniques as Kerning, tracking, and leading Alignment and justification Optical adjustments vs. mechanical adjustments and also Typography and Branding Creating as typographic identity case studies of successful brand typography ,and also experience the Experimental Typography as Typographic art and installations

Reference Books

1 The Elements of Typographic Style., Bringhurst, R., 15 January 2013, Hartley & Marks Inc.,U.S.

2 Designing with Type: A Basic Course in Typography, Designing with Type: A Basic Course in Typography, 1 February 1992, Watson-Guptill.

3 Design as Art, Bruno Munari, 25 September 2008, PENGUIN UK.

4 Why Fonts Matter a multisensory analysis of typography and its influence, Sarah Hyndman, 28 January 2016, Virgin Books .

23MRGD03 - VISUAL IDENTITY AND BRANDING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRGD03	VISUAL IDENTITY AND BRANDING	VIB	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basics of Design, Design culture and consumer behaviour and perception.	2	PO1, PO3
CO2	Apply the basics of design in branding	3	PO1, PO3
CO3	Create digital storytelling.	6	PO1, PO2

Syllabus

Introduction to design, elements of design, principles of design, gestalt\\\'s law, design culture, Visual design, negotiating visual identity, Understanding consumer behaviour, consumer perception, brand guidelines, law of perceptual organization..

Introduction to branding, color psychology, typography, typographic system brand guidelines, brand design, Logo design, package design, brand competitors, brand identity, brand repositioning,

Data Visualization, digital Storytelling, Case studies..

Reference Books

1 Designing Brand Identity: An Essential Guide for the Whole Branding Team, Alina Wheeler, 5th Edition, 8th Dec, 2017, Wiley.

2 Branding: In Five and a Half Steps, Michael Johnson, Illustrated, Thames and Hudson.

3 Logo Design Love: A Guide to Creating Iconic Brand Identities, David Airey, 2014, David Airey.

4 The Brand Gap: How to Bridge the Distance Between Business Strategy and Design, Marty Neumeier, 2003, New Riders.

5 How to Style Your Brand: Everything You Need to Know to Create a Distinctive Brand Identity, Fiona Humberstone, 2015, Copper Beech Press.

6 Identity Designed: The Definitive Guide to Visual Branding, David Airey, 2019, Rockport Publishers.

7 Building A StoryBrand: Clarify Your Message So Customers Will Listen , Donald Miller, 2017, HarperCollins Leadership.

23MRGD04 - PRINT DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRGD04	PRINT DESIGN	PRDG	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Design basics understanding their properties and Recaptureing print media properties with important utilities in society	2	PO1
CO2	Study of Print techniques and their advantages	2	PO2
CO3	Mastery of raster graphics and photo editing techniques. Integrating Photoshop with InDesign for image-rich layouts.	3	PO3

Syllabus

prepress workflow and file preparation---Overview of printing techniques: screen printing, etc.

Print making Series of projects integrating learned principles (e.g., brochure, poster, book design). Emphasis on conceptualization, execution, and presentation.

Experimenting with traditional and contemporarry press workflow and file preparation. Overview of printing techniques: offset, digital, screen printing, etc.

Reference Books

1 Thinking with Type, Ellen Lupton , 6 October 2010, Princeton Architectural Press.

2 Grid Systems in Graphic Design, Josef M?lller-Brockmann, 1 January 1999, Niggli Verlag.

3 IDEAS THAT CHANGED GRAPHIC DESIGN, Steven Heller , 21 January 2019, Laurence King Publishing.

4 The Graphic Design Bible: The definitive guide to contemporary and historical graphic design, Theo Inglis, 28 sep 2023, Ilex Press.

23MRIB01M - INTERNATIONAL BUSINESS ESSENTIALS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIB01M	INTERNATIONAL BUSINESS ESSENTIALS	IBET	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction to International Business	2	PO1
CO2	International Trade and Investment	2	PO2
CO3	Global Market Entry Strategies	3	PO2
CO4	Cross-Cultural Management	3	PO3

Syllabus

Definition and scope of international business Globalization and its impact Theories of international trade

Comparative advantage and competitive advantage Trade policies and barriers Foreign direct investment (FDI)

Modes of entry: Exporting, licensing, franchising, joint ventures, wholly-owned subsidiaries Strategic alliances and partnerships

Cross-Cultural Management

Reference Books

1 Global Business Today, Charles W.L. Hill, 2005, McGraw-Hill Education.

2 International Economics, Paul Krugman, Maurice Obstfeld, Marc Melitz, 2007, Pearson.

3 International Business: Competing in the Global Marketplace, Charles W.L. Hill, G. Tomas M. Hult, 2009, McGraw-Hill Education.

4 Cultures and Organizations: Software of the Mind, Geert Hofstede, Gert Jan Hofstede, Michael Minkov, 2015, McGraw-Hill Education.

23MRIB02M - INTERNATIONAL BUSINESS ENVIRONMENT (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIB02M	INTERNATIONAL BUSINESS ENVIRONMENT	IBEV	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Describe the fundamentals of international business and the global business environment.	2	PO6
CO2	Analyze the impact of political, economic, social, and technological factors on international business operations.	4	PO8, PO9
CO3	Evaluate different international trade theories and their application in global markets.	5	PO6
CO4	Formulate strategies for managing international business risks and leveraging global opportunities.	5	PO6

Syllabus

Introduction to International Business Environment: Overview of international business and globalization. Key drivers and challenges of globalization. Analysis of the global business environment, including political, economic, social, and technological factors. Case studies on the impact of globalization on businesses.

International Trade and Investment: Examination of international trade theories such as absolute advantage, comparative advantage, and Heckscher-Ohlin theory. Understanding trade policies, tariffs, and trade agreements. Foreign direct investment (FDI) and its role in global business. Case studies on successful international trade and investment strategies.

Cultural and Ethical Issues in International Business: Understanding cultural differences using frameworks like Hofstede\'s cultural dimensions and Trompenaars\' model. Impact of culture on business practices and communication. Ethical issues in international business, including corruption and corporate social responsibility (CSR). Case studies on navigating cultural and ethical challenges.

International Business Strategy and Risk Management: Formulating and implementing international business strategies. Risk management in international business, including political risk, economic risk, and currency risk. Strategies for entering and expanding in global markets, such as exporting, joint ventures, and wholly owned subsidiaries. Case studies on strategic decision-making and risk management.

Reference Books

1. "International Business: Competing in the Global Marketplace" , Charles W. L. Hill, G. Tomas M. Hult , 12th , McGraw-Hill Education.
2. "Global Business Today", Charles W. L. Hill, G. Tomas M. Hult, 10th, McGraw-Hill Education.
3. "International Business: The New Realities", S. Tamer Cavusgil, Gary Knight, John Riesenberger, 5th , Pearson.
4. "International Business: Environments and Operations", John D. Daniels, Lee H. Radebaugh, Daniel P. Sullivan, 16th, Pearson.

23MRIB03M - INTERNATIONAL BUSINESS OPERATIONS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIB03M	INTERNATIONAL BUSINESS OPERATIONS	IBO	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts and theories of international business.	2	PO1
CO2	Understand global business environment and its impact on business operations.	2	PO5
CO3	Apply the operational issues related to international trade, investment, and management.	3	PO7
CO4	Apply the strategies used by multinational enterprises (MNEs) in markets.	3	PO7

Syllabus

Introduction to International Business: Course overview and expectations, Globalization and its impact on business. Theories of International Trade and Investment: Comparative advantage and competitive advantage, Foreign direct investment theories.

The Global Economic Environment: Economic systems and development, International monetary system. Political and Legal Environment: Political systems and risk, Legal environment and regulatory issues.

Cultural Environment of International Business: Understanding cultural differences, Cross-cultural communication and negotiation. International Market Entry Strategies: Exporting, licensing, and franchising, Joint ventures and wholly-owned subsidiaries.

International Marketing and R&D: Global marketing strategies, International product development and R&D. Risk Management in International Business: Identifying and managing international business risks, Political and economic risk assessment.

Reference Books

1 International Business: Competing in the Global Marketplace, Charles W. L. Hill and G. Tomas M. Hult, 2022, McGraw-Hill Education.

2 International Business, John D. Daniels, Lee H. Radebaugh, and Daniel P. Sullivan, 2019, Pearson.

3 International Management: Culture, Strategy, and Behavior, Fred Luthans and Jonathan P. Doh, 2017, McGraw-Hill Education.

4 The International Business Environment, Leslie Hamilton and Philip Webster, 2018, Oxford University Press.

23MRIB04M - INTERNATIONAL BUSINESS MODELS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIB04M	INTERNATIONAL BUSINESS MODELS	IBM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate a clear understanding of the core concepts and principles of international business models.	2	PO7
CO2	Apply international business strategies and frameworks to real-world scenarios and case studies.	3	PO7
CO3	Analyze international market entry strategies and business operations in different cultural, economic, and political contexts.	4	PO10
CO4	Evaluate ethical issues and corporate social responsibility practices in international business settings.	5	PO10

Syllabus

Introduction to International Business - Overview of international business and globalization; Comparative advantage, trade barriers, and trade agreements; Global market dynamics.

International Business Strategies - Global, transnational, international, and multidomestic strategies; Strategic planning and implementation; real-world scenarios and case studies.

Market Entry Strategies - Exporting, licensing, franchising Joint ventures, strategic alliances, wholly owned subsidiaries; Cultural dimensions and frameworks; political and economic systems.

Legal and Ethical Issues in International Business - International business law and regulations, Corporate social responsibility and ethical considerations; Opportunities and challenges in emerging markets; Future trends in international business.

Reference Books

1 International Business: Competing in the Global Marketplace, Charles W.L. Hill, G. Tomas M. Hult, 14th, 2023, McGraw-Hill Education.

2 International Business, John D. Daniels, Lee H. Radebaugh, Daniel P. Sullivan, 17th, 2021, Pearson Higher Ed.

3 International Business: Theory and Practice, Ehud Menipaz, Amit Menipaz, 2nd, 2011, Sage Publications.

4 International Business: The Challenges of Globalization, John J. Wild, Kenneth L. Wild, 9th, 2019, Pearson Education.

23MRID01 - INTRODUCTION TO INTERIOR DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRID01	INTRODUCTION TO INTERIOR DESIGN	IID	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand principles of interior design to conceptualize and propose layouts, lighting schemes, material selections, and furnishings that meet the functional and aesthetic requirements of various interior spaces.	2	PO1
CO2	Understand interplay of fundamental elements such as space, line, form, color, texture, and pattern in interior design, and apply this understanding to create cohesive and visually engaging interior spaces.	2	PO3
CO3	Understand fundamental principles of interior design, including balance, harmony, emphasis, rhythm, proportion, scale, and contrast, to develop aesthetically pleasing and functionally effective interior spaces.	2	PO3
CO4	apply the multifaceted role of interior designers, including client collaboration, concept development, layout creation, material and furnishing selection, and project oversight, while also demonstrating an understanding of industry trends, building codes, and sustainability practices essential for creating well-informed and effective interior designs.	3	PO5
CO5	Apply current trends and innovations in interior design, including sustainable design, smart home technology integration, biophilic design principles, flexible space concepts, and minimalistic approaches, in order to inform their design decisions and adapt to evolving industry practices.	3	, PSO3

Syllabus

Interior design is more than just arranging furniture and choosing colors. It is about creating spaces that are functional aesthetically pleasing, and reflect the personality and needs of the inhabitants. Interior designers work with architects contractors and clients to transform empty spaces into livable environments. They consider factors such as layout lighting materials and furnishings to enhance the quality of life within a space.

The Elements of Interior Design Several elements form the foundation of interior design. These include: Space: The foundation of any design, space defines the boundaries within which everything else exists. Line: Lines can create movement, define shapes, and guide the eye throughout a space. Form: Form refers to the shape and structure of objects within a space. Color: Color can evoke emotions, set moods, and visually expand or contract spaces. Texture: Texture adds depth and interest to a space, whether through fabrics, finishes, or materials. Pattern: Patterns add visual interest and can be used to create focal points or unify a space. Understanding how these elements interact is essential for creating harmonious and cohesive interior designs.

Principles of Interior Design In addition to understanding the elements, interior designers must also adhere to certain principles to create successful designs. These principles include: Balance: Achieving visual equilibrium through the distribution of elements within a space. Harmony: Creating a sense of unity and cohesion through the consistent use of elements and principles. Emphasis: Highlighting key elements or focal points to draw attention and create visual interest. Rhythm: Establishing a sense of movement and flow through repetition, progression, or alternation of elements. Proportion and Scale: Ensuring that the size of objects and elements within a space is appropriate to the overall context. Contrast: Using differences in elements such as color, texture, or form to create visual impact and drama. By applying these principles, designers can create spaces that are visually appealing, functional, and comfortable.

The Role of the Interior Designer Interior designers play a crucial role in the design and execution of interior spaces. They collaborate with clients to understand their needs, preferences, and budget constraints. Designers then develop concepts, create layouts, select materials and furnishings, and oversee the implementation of the design plan. Additionally, interior designers must stay abreast of industry trends, building codes, and sustainability practices to ensure that their designs meet both aesthetic and functional requirements.

Trends and Innovations in Interior Design The field of interior design is constantly evolving, influenced by changes in technology, culture, and lifestyle. Some current trends include: Sustainable Design: Increasing emphasis on environmentally friendly materials and practices. Smart Home Technology: Integration of technology to enhance comfort, convenience, and energy efficiency. Biophilic Design: Incorporating elements of nature into interior spaces to promote well-being and connectivity to the environment. Flexible Spaces: Designing multifunctional spaces that can adapt to changing needs and activities. Minimalism: Simplified, clutter free designs that emphasize clean lines and functionality.

Reference Books

1 Space Planning Basics, Karen Mark , 1992, 4th Edition , Van Nostrand Reinhold.

2 Interior Design Illustrated , Francis.D. Ching & orky Bingelli , 1992, 4th Edition , Wiley Publishers.

3 Modern Houses In India , Creativity 13 , 2017, 1st Edition , Creativity 13.

4 The Interior Design Handbook , Frida Ramstedt , 2020,1st Edition , Particular Books.

23MRID02 - SPACE PLANNING AND LAYOUT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRID02	SPACE PLANNING AND LAYOUT	SPL	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand fundamental principles of space planning in interior design, including analyzing spatial requirements, identifying client needs, determining functional requirements, and maximizing space efficiency through the strategic arrangement of furniture and fixtures, while also considering circulation flow, zoning, and the incorporation of flexible design elements to create functional and aesthetically pleasing interiors.	2	PO1
CO2	Understand fundamental design principles such as balance, proportion, scale, and rhythm to create effective spatial layouts. Students will analyze how these principles influence spatial arrangements and make informed design decisions accordingly.	2	PO3
CO3	Understand interior spaces into functional zones based on user activities and requirements. Students will learn techniques for creating clear spatial divisions while ensuring smooth transitions between zones to enhance usability and flow within the space.	2	PO3
CO4	Apply spatial layouts to accommodate multi-functional uses, maximizing flexibility and adaptability. Students will explore methods for incorporating versatile spaces that can serve varying purposes, thereby enhancing the overall functionality of the design	3	PO4
CO5	Apply furniture arrangement strategies to enhance both ergonomic usability and visual appeal within a space. Through the consideration of focal points, traffic patterns, and ergonomic principles, students will learn to position furniture to optimize comfort, usability, and aesthetic coherence.	3	, PSO3

Syllabus

Understanding Space Planning Fundamentals Introduction to Space Planning, Defining space planning in interior design, Importance of effective space planning in creating functional and aesthetically pleasing interiors. Analyzing Spatial Requirements. Identifying client needs and preferences. Determining functional requirements for each space. Considering circulation flow and zoning within the space. Space Utilization Techniques . Maximizing space efficiency through proper arrangement of furniture and fixtures. Incorporating flexible design elements to accommodate varying needs . Balancing open areas with enclosed spaces for privacy and functionality

Principles of Space Layout Design Principles Overview. Exploring key design principles such as balance, proportion, scale, and rhythm . Understanding how these principles influence spatial layout decisions. Zoning and Functionality. Dividing the space into zones based on functionality and user activities . Ensuring smooth transitions between different zones to enhance usability and flow. Incorporating multi-functional spaces to optimize flexibility and adaptability. Furniture Placement Strategies. Arranging furniture to facilitate ergonomic use and enhance visual appeal. Considering focal points and traffic patterns when positioning furniture within the space. Experimenting with different layout configurations to find the optimal arrangement

Spatial Analysis and Optimization Site Analysis and Evaluation. Conducting site surveys to assess existing conditions and constraints. Analyzing site features, such as orientation, views, and natural light availability. Identifying opportunities and challenges that may influence spatial layout decisions. Space Optimization Techniques. Utilizing design strategies to maximize space utilization and functionality. Exploring creative solutions for compact or irregularly shaped spaces. Incorporating storage solutions and built in features to minimize clutter and maximize usable area

Designing for Human Experience Human Centered Design Principles. Prioritizing user comfort, safety, and well-being in spatial design. Incorporating universal design principles to accommodate diverse user needs and abilities. Enhancing user experience through thoughtful consideration of sensory elements, such as lighting, acoustics, and material textures. Psychological Effects of Space. Understanding how spatial layout and design elements influence human behavior and perception. Creating environments that promote relaxation, productivity, and social interaction. Incorporating biophilic design elements to enhance connection with nature and improve overall well being

Integration and Adaptation Integration of Technology and Innovation. Incorporating technology seamlessly into the spatial layout to enhance functionality and convenience. Exploring innovative solutions, such as smart home systems and interactive interfaces, to improve user experience. Adaptation and Future-Proofing. Designing flexible spaces that can adapt to evolving needs and technologies .Considering sustainability principles in spatial design to minimize environmental impact. Future-proofing designs by incorporating resilient and adaptable features that can withstand changing trends and requirements

Reference Books

1 Space Planning Basics , Karen Mark , 1992 , Van Nostrand Reinhold.

2 The Interior Design Handbook , Frida Ramstedt , 2020 , Particular Books.

3 Modern Houses In India , Creativity 13 , 2017 , Creativity 13.

4 Interior Design Illustrated , Francis.D. Ching & orky Bingelli , 1992 , Wiley Publishers.

23MRID03 - INTERIOR MATERIAL AND FINISHES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRID03	INTERIOR MATERIAL AND FINISHES	IMF	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the fundamental concepts of interior materials and finishes, including their definitions, importance, and roles in creating ambiance, functionality, and aesthetics within interior design.	2	PO1
CO2	Understanding of the characteristics, properties, and applications of various natural materials such as wood, stone, leather, and natural fibers in interior design.	2	PO3
CO3	Understanding of the advantages and limitations of using synthetic materials such as plastics, laminates, and engineered wood in interior design.	2	PO5
CO4	Apply, evaluate, and synthesize finishes and surface treatments to achieve sophisticated and compelling interior environments.	3	, PSO2
CO5	Synthesizing theoretical knowledge and practical application, students will forecast future developments in materials and finishes and assess their potential implications for the evolving landscape of interior design practice.	3	, PSO1

Syllabus

Introduction to Materials and Finishes. Definition and importance of materials and finishes in interior design. The role of materials in creating ambiance, functionality, and aesthetics. Overview of different types of materials and finishes commonly used in interior design, such as wood, metal, glass, fabric, paint, and wallpaper.

Natural Materials . Exploration of natural materials like wood, stone, leather, and natural fibers. Characteristics, properties, and applications of each natural material in interior design. How to incorporate natural materials to enhance warmth, texture, and visual interest in spaces. Sustainable sourcing and eco-friendly alternatives for natural

Synthetic Materials . Examination of synthetic materials such as plastics, laminates, and engineered wood. Advantages and limitations of using synthetic materials in interior design. Innovative uses of synthetic materials in modern interior design, including high-performance polymers and composite materials. Considerations for durability, maintenance, and environmental impact when selecting synthetic materials.

Finishes and Surface Treatments. Understanding the role of finishes in defining the look and feel of interior spaces. Different types of finishes, including matte, glossy, textured, and reflective. Techniques for applying finishes such as painting, staining, varnishing, and polishing. Creative ways to combine finishes for visual contrast and aesthetic appeal.

Trends and Future Directions. Exploration of current trends in materials and finishes in interior design. Emerging technologies and materials shaping the future of interior design, such as smart materials and 3D printing. The influence of sustainability and wellness on material selection and design choices. Predictions for future developments in materials and finishes and their impact on the practice of interior design

Reference Books

1 In detail Interior Spaces , Christian Schittich, 1st, 2002, K?sel GmbH & Co. KG, Kempten.

2 Designing Interior Architecture, Sylvia Leydecker, 1st, 2013, Birkhauser,.

3 The Interior Design Business Handbook: A Complete Guide to Profitability, Mary V. Knackstedt, 1st, 2001, Wiley, Year: 2001.

4 Building Materials: Material Theory and the Architectural Specification, Katie Lloyd Thomas, 1st, 2022, Bloomsbury Visual Arts, Year: 2022.

23MRID04 - FURNITURE AND ACCESSORIES DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRID04	FURNITURE AND ACCESSORIES DESIGN	FAD	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand comprehensive knowledge and practical skills in the selection, placement, and utilization of furniture and accessories to enhance interior spaces.	2	PO1
CO2	Understand and articulate the principles of selecting and arranging furniture in interior spaces.	2	, PSO2
CO3	Understand various types of accessories, such as decorative objects, artwork, and textiles, and explain how these elements contribute to the overall aesthetic of a space.	2	PO2
CO4	Applying different design styles and their characteristic features and strategies for mixing and matching furniture and accessories from different styles	3	PO3
CO5	Apply current trends and innovations within the furniture and accessories industry and able to examine emerging materials, technologies, and design approaches, and analyze case studies that highlight innovative uses of furniture and accessories in contemporary design.	3	PO4

Syllabus

Co1: Introduction to Furniture and Accessories in Interior Design. Overview of the role of furniture and accessories in interior design. Importance of selecting the right furniture and accessories for different spaces. Basic principles of design that apply to furniture and accessories. Historical overview of furniture and accessory styles. Introduction to key terminology and concepts.

Co2: Furniture Selection and Placement. Understanding the function and purpose of each room. Factors to consider when selecting furniture (e.g., size, style, material). Tips for creating a cohesive look with furniture styles. Guidelines for arranging furniture to maximize space and functionality. Importance of traffic flow and ergonomics in furniture placement.

Co3: Accessories: Adding Personality and Flair. Definition and types of accessories in interior design (e.g., decorative objects, artwork, textiles). How accessories contribute to the overall aesthetic of a space. Tips for selecting accessories that complement the furniture and enhance the design theme. Creative ways to display and arrange accessories for visual impact. DIY and budget-friendly ideas for accessorizing.

Co4: Mixing and Matching Styles. Understanding different design styles and their characteristic features. Strategies for mixing and matching furniture and accessories from different styles. Examples of successful design combinations and how they create visual interest. Balancing cohesion and contrast when integrating diverse elements. Common mistakes to avoid when blending styles.

Co5: Trends and Innovations in Furniture and Accessories. Exploration of current trends in furniture and accessories. Emerging materials, technologies, and design approaches shaping the industry. Case studies highlighting innovative uses of furniture and accessories in contemporary design. Sustainable and eco-friendly options in furniture and accessories. Predictions for future directions in furniture and accessory design.

Reference Books

1 Furniture Design: An Introduction to development materials and manufacturing, Stuart Lawson, 1st,2013, Laurence King Publishing.

2 Ergonomics Principles in Design: An Illustrated Fundamental Approach, Prabir Mukhopadhyay, 1st, 2022, CRC Press.

3 Furniture Design, Jerzy Smardzewski, 1st, 2015, Springer.

4 Design: History, Theory and Practice of Product Design, Bernhard E. B?rdek, 1st, 2005, Springer Science+Buisness Media.

23MRIM01 - APPLIED DESIGN THINKING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIM01	APPLIED DESIGN THINKING	ADT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Develop a deep understanding of user needs through empathy and research techniques.	2	PO3
CO2	Define clear and actionable problem statements based on user insights.	3	PO5
CO3	Generate a wide range of innovative ideas through brainstorming and ideation techniques.	4	
CO4	Create and test prototypes to refine ideas and solutions.	5	PO9
CO5	Implement and evaluate design solutions in real-world contexts.	6	, PSO2

Syllabus

Introduction to Design Thinking: Overview of design thinking principles; The design thinking process: empathize, define, ideate, prototype, test; Historical context and contemporary applications. Empathy and User Research: Techniques for understanding users (interviews, observations, surveys); Building empathy maps; Identifying user needs and pain points; Case studies on successful user research.

Problem Definition: Framing the right problem; Crafting problem statements and how-might-we questions; Tools for analysis and synthesis (affinity diagrams, journey maps); Group activities to practice problem definition

Ideation Techniques: Brainstorming methods (mind mapping, SCAMPER, role-playing); Encouraging creativity and divergent thinking; Evaluating and selecting ideas; Collaborative ideation workshops

Prototyping: Types of prototypes (low-fidelity, high-fidelity), Rapid prototyping techniques, Tools for prototyping (paper, digital tools), Iterative testing and feedback loops. Testing and Feedback: Designing and conducting usability tests, Gathering and analyzing feedback, Refining prototypes based on user feedback, Case studies on successful prototyping and testing.

Implementation and Impact Evaluation: Strategies for implementing design solutions, Measuring the impact of design solutions, Scaling and sustaining innovations, Real-world project work and presentations.

Reference Books

1 Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown, 1st Edition, Harper Business.

2 Design Thinking: Understanding How Designers Think and Work, Nigel Cross, 1st Edition, Berg Publishers.

3 The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems, Michael Lewrick, Patrick Link, and Larry Leifer, 1st Edition, Wiley.

4 Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days, Jake Knapp, 2016, Simon & Schuster.

23MRIM02 - BUSINESS MODEL INNOVATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIM02	BUSINESS MODEL INNOVATION	BMI	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze the importance of business model innovation using real-world case studies.	4	PO2, PO8, PSO2
CO2	Utilize the Business Model Canvas to create and assess business models.	3	PO2, PO8, PSO2
CO3	Analyze the impact of disruptive innovation on existing business models.	4	PO2, PO8, PSO2
CO4	Develop a plan for implementing digital transformation in an existing business model.	6	PO2, PO8, PSO2
CO5	Develop a sustainable business model using appropriate tools.	6	PO2, PO8, PSO2

Syllabus

The definition of a business model, the importance of business model innovation, an overview of popular business models, the historical evolution of business models, and case studies of successful business model innovations.

Business Model Canvas, the Value Proposition Canvas, SWOT Analysis, PESTEL Analysis, and the Blue Ocean Strategy.

The definition and characteristics of disruptive innovation, how disruptive innovation impacts business models, case studies of disruptive innovations, and strategies for leveraging disruptive innovation.

The definition of digital transformation, the impact of digital technologies on business models, examples of digital business models, and implementing digital transformation in business models.

The definition of sustainable business models, principles of sustainable business model innovation, case studies of sustainable business models, and tools for developing sustainable business models.

Reference Books

1 Business Model Generation, Alexander Osterwalder, Yves Pigneur, 1st (2010), Wiley.

2 Blue Ocean Strategy, W. Chan Kim, Ren?e Mauborgne, Expanded Edition (2015), Harvard Business Review Press.

3 The Innovator's Dilemma, Clayton M. Christensen, 1st (2013), Harvard Business Review Press.

4 Leading Digital: Turning Technology into Business Transformation, George Westerman, Didier Bonnet, Andrew McAfee, 1st (2014), Harvard Business Review Press.

23MRIM03 - VENTURE MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIM03	VENTURE MANAGEMENT	VMT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understand the fundamentals of venture management, including the different types of ventures, the entrepreneurial ecosystem, and the roles of incubators and accelerators.	2	PO2, PO10, PSO3
CO2	apply techniques for market research, idea generation, and feasibility analysis to develop comprehensive business plans and financial projections for new ventures.	3	PO2, PO10, PSO3
CO3	analyze various funding strategies, legal structures, and regulatory requirements to determine the most effective approaches for launching and growing a new venture.	4	PO2, PO10, PSO3
CO4	evaluate growth strategies, marketing plans, and operational processes to optimize efficiency, market expansion, and strategic partnerships for scaling ventures.	5	PO2, PO10, PSO3
CO5	evaluate risk management strategies, corporate social responsibility initiatives, and exit plans to ensure the sustainability and ethical management of ventures, and to prepare for successful exits through mergers, acquisitions, or IPOs.	5	PO2, PO10, PSO3

Syllabus

Overview of venture management; Types of ventures: startups, SMEs, and corporations; Entrepreneurial ecosystems; Role of incubators and accelerators; Networking and building entrepreneurial communities; Identifying opportunities and idea generation; Market research and analysis; Feasibility analysis and business models; Lean startup methodology

Business planning and components of a business plan; Writing a compelling business plan; Financial planning and projections; Funding strategies: bootstrapping vs. external funding; Venture capital, angel investors, and crowdfunding; Preparing for investor meetings and pitches; Legal structures for new ventures; Intellectual property rights; Regulatory compliance and licenses; Team building and management; Leadership and management skills; Human resource strategies for startups.

Growth strategies: organic growth vs. scaling; Market expansion and diversification; Strategic partnerships and alliances; Operations and supply chain management; Designing efficient operations; Supply chain management for startups; Technology and process optimization; Marketing and sales strategies; Developing a marketing strategy; Sales techniques and customer relationship management (CRM); Digital marketing and social media; Financial management and control; Financial statements and analysis; Budgeting and cash flow management; Performance metrics and KPIs.

Innovation and continuous improvement; Fostering a culture of innovation; Continuous improvement processes; Adapting to market changes; Risk management and crisis handling; Identifying and assessing risks; Developing risk mitigation strategies; Crisis management and recovery plans; Corporate social responsibility (CSR); Ethical issues in entrepreneurship; Building a sustainable business; Exit strategies: mergers, acquisitions, IPOs; Succession planning and leadership transition; Preparing for life after the venture.

Reference Books

1 The Lean Startup, Eric Ries, 1st (2011), Crown Business.

2 Business Model Generation, Alexander Osterwalder, Yves Pigneur, 1st (2010), Wiley.

3 Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist, Brad Feld, Jason Mendelson, 3rd (2016), Wiley.

4 The Startup Owner's Manual, Steve Blank, Bob Dorf, 1st (2012), K&S Ranch.

23MRIM04 - BUSINESS AND LEADERSHIP (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIM04	BUSINESS AND LEADERSHIP	BL	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze and evaluate various leadership theories and models, applying them to real-world business scenarios.	2	
CO2	Develop effective communication and conflict resolution skills essential for leading and managing teams, Demonstrate an understanding of ethical decision-making frameworks and apply them to leadership challenges.	2	
CO3	Examine and critically assess the impact of organizational culture on leadership practices and strategies for fostering a positive organizational environment.	3	
CO4	Plan, design, and execute a comprehensive capstone project that addresses a specific leadership challenge, incorporating strategic thinking and practical leadership skills.	4	
CO5	Apply leadership theories and models in practical settings, Enhance self-assessment and personal development planning, Demonstrate effective ethical decision-making, communication, and conflict resolution, Lead and manage teams effectively, Execute strategic planning and organizational change initiatives, Innovate and solve complex problems and Complete and present a capstone project.	5	

Syllabus

Foundations of Leadership: Introduction to leadership; Course overview and expectations; Definition and importance of leadership; Overview of leadership theories; Trait Theory; Behavioral Theory; Contingency Theory; Transformational and Transactional Leadership; Leadership self-assessment tools; Identifying personal leadership styles and strengths; Setting personal development goals

Ethics, Communication, and Team Leadership: Role of ethics in leadership; Ethical decision-making frameworks; Case studies on ethical leadership; Effective communication skills for leaders; Active listening and feedback; Leading through conflict resolution; Building and leading effective teams; Understanding team roles and dynamics; Strategies for team motivation and engagement.

Strategic and Organizational Leadership: Strategic thinking and planning; Change management and leadership; Innovation and leadership in a global context; Impact of organizational culture on leadership; Creating and sustaining a positive organizational culture; Leading organizational change.

Decision Making, Challenges, and Capstone Project: Leadership decision-making processes and models; Critical thinking and problem-solving; Case studies on leadership decision-making; Current trends and challenges in leadership; Leadership in the digital age; Future directions in leadership research; Capstone project preparation; Project planning and proposal development; Group discussions and feedback; Capstone project presentations; Peer review and feedback; Course wrap-up and reflections.

Leadership Practicum Lab: This module provides a practical, hands-on approach to applying the leadership theories, models, and skills from Modules 1 to 4. Through interactive exercises, simulations, and real-world applications, students will refine their leadership abilities, focusing on self-assessment, ethical decision-making, communication, conflict resolution, team dynamics, strategic planning, organizational culture, change management, innovation, critical thinking, and capstone project execution..

Reference Books

1 Leadership: Theory and Practice, Peter G. Northouse, 9th Edition (2021), Sage Publications.

2 Ethical Leadership, Joanne B. Ciulla, 1st Edition (2004), McGraw-Hill Education.

3 Strategic Leadership: Theory and Research on Executives, Top Management Teams, and Boards, Sydney Finkelstein, Donald C. Hambrick, and Albert A. Cannella, 1st Edition (2008), Oxford University Press.

4 Decision Making for Leaders: The Analytic Hierarchy Process for Decisions in a Complex World, Thomas L. Saaty, 3rd Edition (2012), RWS Publications.

5 Experiential Learning: Experience as the Source of Learning and Development, David A. Kolb, 2nd Edition (2014), Pearson.

23MRIP01 - EMERGENCE AND DEVELOPMENT OF IPR (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIP01	EMERGENCE AND DEVELOPMENT OF IPR	EDIPR	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze the historical foundations and philosophical justifications for Intellectual Property Rights.	3	PO2
CO2	Critically evaluate the different types of IPR (patents, copyrights, trademarks, etc.) and their application in the Indian and international contexts.	3	PO8
CO3	Identify and explain the key international treaties and organizations governing IPR.	2	PO5
CO4	Examine the contemporary challenges and debates surrounding IPR, such as access to knowledge, biopiracy, and the digital divide.	3	PO10
CO5	Apply their understanding of IPR principles to real-world scenarios involving innovation, creativity, and competition	3	, PSO2

Syllabus

Introduction to Intellectual Property Rights (IPRs) Concept and historical development of IPRs Theories justifying IPR protection (natural rights, utilitarian, etc.) The economic and social importance of IPRs in a globalized world

Types of Intellectual Property Rights Patents: Subject matter, patentability criteria, infringement, and enforcement Copyrights: Originality, scope of protection, fair use limitations, and digital copyright issues Trademarks: Functions, registration process, infringement, and dilution Trade Secrets: Protection of confidential information and unfair competition

The Indian IPR Regime Constitutional provisions and legislative framework for IPRs in India The Indian Patent Act, Copyright Act, Trademark Act, and other relevant laws The role of Indian Patent Office, Copyright Office, and Trademark Registry Enforcement mechanisms for IPR violations in India

The International IPR Landscape Major international treaties and conventions governing IPR (e.g., Paris Convention, Berne Convention, TRIPS Agreement) The role of World Intellectual Property Organization (WIPO) Harmonization vs. national interests in international IPR regimes

Contemporary Issues and Debates in IPR Access to knowledge and essential medicines Biopiracy and the protection of traditional knowledge The digital divide and its impact on IPR enforcement Open-source software and alternative licensing models The future of IPR in a knowledge-based economy

Reference Books

1. The Law of Intellectual Property, Graeme B. Dinwoodie , 2nd , Carolina Academic Pr; 2nd edition (4 November 2008).
2. INTELLECTUAL PROPERTY: LAW & THE INFORMATION SOCIETY Cases & Materials , James Boyle William Neal Reynolds & Jennifer Jenkins Clinical Professor of Law (Teaching) & Director, Center for the Study of the Public Domain Duke Law School , Fifth Edition, 2021 , Center for study of public domain.
3. Intellectual Property Rights, P.S. Narayanan, 3rd , Eastern Law House Private Ltd; Third Edition (1 January 2001).
4. Law Relating To Intellectual Property, 2011, B.L. Wadehra, 1st, Universal Law Publishing - An imprint of LexisNexis; Fifth edition (1 January 2016).

23MRIP02 - LAW OF COPYRIGHT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIP02	LAW OF COPYRIGHT	LOCR	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the foundational principles of Indian copyright law, including its historical development, scope, and application to various works.	2	PO2
CO2	Understanding the complex copyright infringement cases, applying relevant legal tests and defenses to determine the outcome. They will also be able to evaluate the effectiveness of remedies available for copyright infringement.	2	PO5
CO3	Understand the interplay between copyright law and technological advancements, including the challenges and opportunities posed by the digital environment.	2	, PSO2
CO4	Analyzing the contemporary copyright issues, proposing potential solutions and evaluating their impact on the creative industry and society at large.	3	PO7
CO5	Analyse the contemporary legal developments in Copyrights Case laws	4	, PSO1

Syllabus

Concept of Copyright Definition, nature, and scope of copyright Copyright as a bundle of rights Subject matter of copyright Author and ownership of copyright BTL Levels: Remember, Understand, Apply

Historical Development of Copyright Law Copyright law in India: A brief overview International copyright conventions Impact of technological advancements on copyright law BTL Levels: Remember, Understand, Analyze

Infringement of Copyright Primary and secondary infringement Tests of infringement (literal copying, substantial similarity) Defenses to copyright infringement Remedies for copyright infringement BTL Levels: Understand, Apply, Analyze

Moral Rights of Authors Concept of moral rights Rights of paternity and integrity Limitations on moral rights Remedies for violation of moral rights BTL Levels: Understand, Apply, Evaluate

Fair Use and Fair Dealing Concept of fair use and fair dealing Factors to consider for fair use/fair dealing Exceptions to copyright infringement BTL Levels: Understand, Apply, Analyze

Copyright Term and Ownership Duration of copyright Ownership of copyright Assignment and license of copyright BTL Levels: Understand, Apply, Analyze

Copyright in Digital Environment Copyright issues in the digital age Copyright and software Copyright and internet BTL Levels: Understand, Analyze, Evaluate

Emerging Challenges and Future Trends Copyright and artificial intelligence Copyright and 3D printing Copyright and open source BTL Levels: Analyze, Evaluate, Create

Reference Books

1 Law of Copyright and Industrial Designs , P. Narayanan, 2023, Eastern Law House .

2 : Law of Copyright and Intellectual Property, Sushma Malik, 2023, LexisNexis Butterworths.

3 Intellectual Property Rights: Law and Practice, R.K. Dhawan, 2023, exisNexis Butterworths .

4 Cyber Crimes and Ecommerce, Dr. K.I.Pavan Kumar, 2021 1st Edition, Rubicon Publications.

23MRIP03 - LAW OF PATENTS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIP03	LAW OF PATENTS	LOPS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts and history of patent law.	1	
CO2	Analyse the criteria for patentability and the process of obtaining a patent.	3	
CO3	Evaluate the rights and obligations of a patent holder. .	4	
CO4	Apply knowledge of patent law to assess infringement and enforcement issues.	4	
CO5	Explore the impact of patents in various engineering fields and the ethical considerations involved	4	

Syllabus

Introduction to Patent: Law History and development of patent law Types of patents Importance of patents in technology and engineering International treaties and conventions (e.g., TRIPS, PCT)

Patentability Criteria and Application Process: Patentable subject matter Novelty, inventive step, and industrial applicability Patent application process Patent search and drafting Filing procedures and timelines Patent examination and prosecution

Rights and Obligations of a Patent Holder: Scope and duration of patent rights Licensing and assignment of patents Obligations and maintenance of patents Patent marking and notice

Infringement, Enforcement, and Ethical Considerations: Types of patent infringement Legal remedies and defenses against infringement Patent litigation process Alternative dispute resolution (ADR) in patent disputes Ethical issues in patenting and technology

Reference Books

1 Patent Law and Policy: Cases and Materials , Robert P. Merges, John F. Duffy , 2017, Carolina Academic Press.

2 Principles of Patent Law: Cases and Materials , Roger E. Schechter and John R. Thomas , 2016, West Academic Publishing.

3 Patent Law: A Practitioner's Guide, Barry L. Grossman and Gary M. Hoffman, 2013, Practising Law Institute (PLI).

4 Intellectual Property: Patents, Trademarks, and Copyright, Richard Stim, 2020., NOLO.

23MRIP04 - LAW OF TRADEMARK (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIP04	LAW OF TRADEMARK	LOTM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understanding the concept and purpose of trademarks within the broader intellectual property (IP) framework.	2	PO2
CO2	Analyze the provisions of the Indian Trademark Act, 1999 including registrability of trademarks, classification of goods and services, and the registration process	3	PO4, PSO2
CO3	Evaluate the concept of trademark infringement and remedies available under Indian law.	3	
CO4	Compare and contrast the Indian trademark regime with key international treaties and conventions like the Paris Convention for the Protection of Industrial Property and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).	3	PO6
CO5	Develop skills in identifying and conducting trademark searches in India and internationally. Apply trademark law principles to practical scenarios such as brand development, licensing, and enforcement actions.	4	, PSO1

Syllabus

Introduction to Trademarks Definition and nature of trademarks Functions and importance of trademarks Types of trademarks (logos, slogans, etc.) Historical development of trademark law

The Indian Trademark Act, 1999 Key provisions of the Act Registrable and non-registrable trademarks Classification of goods and services The registration process

Trademark Infringement and Remedies Concept of trademark infringement Tests for determining infringement Defenses to infringement actions Remedies for trademark infringement (injunctions, damages, etc.)

International Trademark Law Introduction to international treaties and conventions (Paris Convention, TRIPS) International registration system (Madrid Protocol) Comparative analysis of trademark protection in different jurisdictions

Practical Applications of Trademark Law Conducting trademark searches Brand development and trademark selection strategies Trademark licensing agreements Enforcement of trademark rights in India and abroad

Reference Books

1 The Trade Marks Act, 1999 - Bare Act pen_spark, Parliament, 1st, Parliament.

2 Law of Trade Marks & Passing off , P Narayanan, 6th, EASTERN LAW HOUSE.

3 15% Saving Great Deals Law of Trademarks - Including International Registration under Madrid Protocol and Geographical Indications, K C Kailasam, Ramu Vedaraman, 4th, Lexis Nexis.

4 Law Relating To Trade Marks, Passing Off and Geographical Indication of Goods, D P Mittal, 2022 2nd, Commercial Law Publishers.

23MRMI01 - MANAGEMENT INFORMATION SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRMI01	MANAGEMENT INFORMATION SYSTEMS	MIS	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Illustrate the basic concepts and technologies used in the field of management information systems from technical, socio-ethical and business perspective.	2	PO1, PO2, PSO3
CO2	Apply various knowledge representation methods with different technology infrastructure and business intelligence.	3	PO2, PO3, PSO2
CO3	Analyse and interpret the roles that various types of information systems play in supporting various business functional areas.	4	PO1, PO3, PSO2
CO4	Distinguish the relationships between concepts of information systems, organization, management, and strategy.	4	PO1, PO3, PSO3

Syllabus

Information Systems Analysis & Design, Fundamentals of Data Systems Analytics, Visualization & Engineering, Information Systems in Global Business Today.

EBusiness: How Businesses Use Information Systems, Information Systems, Organizations, and Strategy, Ethical and Social Issues in Information Systems.

Enterprise Resource Planning, Business Systems Modelling & Design, Information Technology Infrastructure, Foundations of Business Intelligence, Telecommunications, the Internet, and Wireless Technology, E-Commerce Design & Development, Supply Chain Management & Fintech for MIS, Securing Information Systems.

Achieving Operational Excellence and Customer Intimacy Enterprise Applications, Digital Markets, Digital Goods, Managing Knowledge, and Collaboration. Enhancing Decision Making.

Reference Books

1 Management Information Systems, KEN LAUDON, JANE LAUDON, RAJANISH DASS, 2 (2012), Pearson.

2 Information Systems Today: Managing the Digital World, Joseph (Joe) Valacich, 3 (2014), Pearson.

3 The Oxford Handbook of Management Information Systems: , Wendy L. Currie, 2 (2013), Oxford Handbooks.

4 The Oxford Handbook of Management Information Systems, Wendy L. Currie, 2 (2013), Oxford Handbooks.

23MRMI02 - INFORMATION SYSTEM ANALYSIS & DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRMI02	INFORMATION SYSTEM ANALYSIS & DESIGN	ISAD	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Illustrate the basic concepts and technologies used in the field of management information systems from technical, socio-ethical and business perspective.	2	PO1, PO2, PO3, PSO1
CO2	CO2 Apply various knowledge representation methods with different technology infrastructure and business intelligence.	3	PO1, PO2, PO4, PSO1
CO3	Analyse and interpret the roles that various types of information systems play in supporting various business functional areas	4	PO1, PO3, PO4, PSO1
CO4	Distinguish the relationships between concepts of information systems, organization, management, and strategy	4	PO2, PO3, PO4, PSO1

Syllabus

Module 1 Information Systems Analysis & Design, Fundamentals of Data Systems Analytics, Visualization & Engineering, Information Systems in Global Business Today

Module 2 EBusiness: How Businesses Use Information Systems, Information Systems, Organizations, and Strategy, Ethical and Social Issues in Information Systems.

Enterprise Resource Planning, Business Systems Modelling & Design, Information Technology Infrastructure, Foundations of Business Intelligence, Telecommunications, the Internet, and Wireless Technology, E-Commerce Design & Development, Supply Chain Management & Fintech for MIS, Securing Information Systems.

Achieving Operational Excellence and Customer Intimacy Enterprise Applications, Digital Markets, Digital Goods, Managing Knowledge, and Collaboration. Enhancing Decision Making.

Reference Books

1 Management Information Systems, KEN LAUDON, JANE LAUDON, RAJANISH DASS, 2014, Pearson .

2 2 Information Systems Today: Managing the Digital World Joseph (Joe) Valacich Pearson 2018, Joseph (Joe) Valacich , 2018, Pearson .

3 The Oxford Handbook of Management Information Systems: Critical Perspectives and New Directions, Wendy L. Currie, 2011, Oxford Handbooks.

4 MIS: Managing Information Systems in Business, Government and Society, Rahul De, 2018, Wiley Pubications.

5 Information Systems for Modern Management Text and cases, A Digital Firm Perspective, Waman S Jawadekar, 2014, McGraw Hill. .

23MRMI03 - BUSINESS INTELLIGENCE & ANALYTICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRMI03	BUSINESS INTELLIGENCE & ANALYTICS	BIA	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand appropriate chart types and graphical representations based on data characteristics and communication goals.	2	PO1, PO2, PSO3
CO2	Understand the concepts and principles of business intelligence and data warehousing.	3	PO2, PO3, PSO2
CO3	Apply effectively the usage of the visual analytics functionality of SAS Viya to analyse and visualize data.	4	PO1, PO3, PSO2
CO4	Create advanced and interactive data visualizations using SAS Viya.	4	PO1, PO3, PSO3

Syllabus

Data Visualization and Visual Analytics. In this model, we will go over the need for data visualization in business reporting. We will identify the benefits of data visualization as well as differentiate between types of data visualizations. We will also overview visual analytics and the landscape of visual analytics tools. Finally, in our activity, we will describe an effective visualization and how to derive value and insight based on available data points.

Visual Analytics Basics and SAS Viya Platform. This module introduces SAS Visual Analytics and SAS Viya. Through this module, we will identify the phases and select the features of SAS Visual Analytics. In our activity, we will identify the types of reports that could be useful for specific datasets. We will also describe the import process for datasets in SAS Data studio.

Developing Advanced Visualizations with SAS Viya. Through this module, we will go over how to use SAS Viya to create data visualizations. We will identify key features and functions of SAS Visual Analytics. We will also learn key functions in SAS and be able to differentiate between their functionalities. Finally, in our activity, we will create interactive data reports and describe the value and insights that can be derived from data reports.

Developing Advanced Visualizations with SAS Viya. Through this module, we will go over how to use SAS Viya to create data visualizations. We will identify key features and functions of SAS Visual Analytics. We will also learn key functions in SAS and be able to differentiate between their functionalities. Finally, in our activity, we will create interactive data reports and describe the value and insights that can be derived from data reports.

Reference Books

1 Business Intelligence: A Managerial Perspective on Analytics, Ramesh Sharda, Dursun Delen, and Efraim Turban, 2 (2012), Pearson.

2 Business Intelligence Guidebook: From Data Integration to Analytics, Rick Sherman, 3 (2013), Morgan Kaufmann.

3 Business Intelligence Guidebook: From Data Integration to Analytics, Rick Sherman, 3 (2013), Morgan Kaufmann.

4 Business Intelligence: A Managerial Perspective on Analytics, Ramesh Sharda, Dursun Delen, and Efraim Turban, 2 (2012), Pearson.

23MRMI04 - EMERGING TECHNOLOGIES IN MIS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRMI04	EMERGING TECHNOLOGIES IN MIS	ETIM	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Illustrate the basic concepts and technologies used in the field of management information systems from technical, socio-ethical and business perspective.	2	PO1, PO2, PSO3
CO2	Apply various knowledge representation methods with different technology infrastructure and business intelligence.	3	PO2, PO3, PSO2
CO3	Analyse and interpret the roles that various types of information systems play in supporting various business functional areas.	4	PO1, PO3, PSO2
CO4	Distinguish the relationships between concepts of information systems, organization, management, and strategy.	4	PO1, PO3, PSO3

Syllabus

Information Systems Analysis & Design, Fundamentals of Data Systems Analytics, Visualization & Engineering, Information Systems in Global Business Today.

EBusiness: How Businesses Use Information Systems, Information Systems, Organizations, and Strategy, Ethical and Social Issues in Information Systems.

Enterprise Resource Planning, Business Systems Modelling & Design, Information Technology Infrastructure, Foundations of Business Intelligence, Telecommunications, the Internet, and Wireless Technology, E-Commerce Design & Development, Supply Chain Management & Fintech for MIS, Securing Information Systems.

Achieving Operational Excellence and Customer Intimacy Enterprise Applications, Digital Markets, Digital Goods, Managing Knowledge, and Collaboration. Enhancing Decision Making.

Reference Books

1 Management Information Systems, KEN LAUDON, JANE LAUDON, RAJANISH DASS, 2 (2012), Pearson.

2 Information Systems Today: Managing the Digital World, Joseph (Joe) Valacich, 3 (2013), Pearson.

3 Management Information Systems, KEN LAUDON, JANE LAUDON, RAJANISH DASS, 2 (2012), Pearson.

4 Information Systems Today: Managing the Digital World, Joseph (Joe) Valacich, 3 (2013), Pearson.

23MROB01M - ORGANIZATIONAL BEHAVIOUR (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MROB01M	ORGANIZATIONAL BEHAVIOUR	POM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the concepts of OB to implement different models of OB	3	PO9
CO2	Apply the concepts of individual behaviour to deal with different types of people at work place	3	PO9
CO3	Apply the concepts of groups and dynamics to deal with groups of employees at work place	3	PO9
CO4	Apply the knowledge of organisational culture, change, conflict, development and stress to develop appropriate model in the organisation.	3	PO9

Syllabus

Introduction to Organizational Behavior, Evolution of management thought, five functions of management, Evolution of OB, models of OB (Autocratic, Custodial, Supportive, Collegial and SOBC), Importance of Organizational Behavior

Foundations of Individual Behavior: Personality, Personality determinants; Personality traits: MBTI , The Big Five Model, Major personality attributes influencing OB; Psycho,Analytic Theory , Johari Window , Values , Types of Values; Perception, Perceptual process; Factors influencing Perception; perceptual distortion; Linkage between perception and individual decision making Theories of Motivation , Hierarchy Needs Theory , Two,Factor Theory , Expectancy Theory; Applications of Motivation; Attitudes , Source of attitudes; Types of Attitudes, Attitudes and consistency , Cognitive Dissonance theory. Learning, Theories of learning; Principles of learning;

Foundations of Group Behavior: Groups , Nature of groups; Types of groups; Stages of Group Development; Group Cohesiveness; Group Decision-Making; Leadership , Nature; Theories of leadership: Trait Theories, Behavioral Theories and Contingency Theories;

Conflict Management, Transactions in conflict thought, Functional versus Dysfunctional conflict, The Conflict process, Conflict Management. Stress, Causes and consequences of stress, Stress management. Organizational Culture and Change Management: Nature and Functions of culture, Creating and sustaining Organizational Culture, Forces for change, Resistance to change, Approaches to Managing Organizational Change, Organizational Development, Techniques of organizational development.

Reference Books

1 Organizational Behavior, Neharika Vohra Stephen P. Robbins, Timothy A. Judge, 18 (2022), Pearson.

2 Organizational Behavior: An Evidence - Based Approach, Fred Luthans, 12 (2017), McGraw Hill Education.

3 Organisational Behavior, Mary Von Glinow, Steven Mcshane , 7 (2014), McGraw-Hill Education.

4 ORGANIZATIONAL BEHAVIOUR: TEXT AND CASES, K. Chitale, Avinash , Prasad Mohanty, Rajendra , Rajaram Dubey, Nishith , 2 (2019), PHI.

23MROB02M - ORGANIZATIONAL BEHAVIOUR MODELS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MROB02M	ORGANIZATIONAL BEHAVIOUR MODELS	OBM	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand key concepts and theoretical frameworks in organizational behaviour, including classical and contemporary models.	2	PO9
CO2	Apply advanced theories and models to analyze individual behavior and psychological processes within organizations.	3	PO8, PSO2
CO3	Analyze group dynamics, teamwork, and leadership theories to understand their impact on organizational performance.	4	PO9
CO4	Appraise strategies for organizational development and change management, integrating theory with practical application.	5	PO9

Syllabus

Foundations of Organizational Behaviour: Overview of OB, its definition, importance, and historical development. Theoretical frameworks and models including classical, human relations, and systems approaches. Examination of organizational culture, its dimensions, types, and effects on behavior. Analysis of organizational structure, including design principles, types, and influencing factors.

Individual Behavior in Organizations: Investigation of personality theories and assessments, focusing on workplace implications. Study of major motivation theories, emphasizing their practical applications. Examination of job satisfaction and organizational commitment theories and their outcomes. Analysis of emotional intelligence and the management of emotions in organizational contexts.

Group Dynamics and Teamwork: Study of group dynamics, including formation, roles, norms, and cohesiveness. Examination of factors contributing to team effectiveness, such as composition and development stages. Exploration of various leadership theories and styles, and their impact on team performance. Analysis of communication processes, barriers, and techniques for effective organizational communication.

Organizational Development and Change: Introduction to OD principles and practices, focusing on planned change strategies. Study of change management theories and models, with emphasis on managing organizational change. Exploration of factors fostering a creative climate and strategies to drive innovation. Discussion of emerging trends and future directions, including technology and globalization impacts.

Reference Books

1 ORGANIZATIONAL BEHAVIOUR, Robbins, S. P., & Judge, T. A., 18th, 2010, Pearson.

2 "Organization Theory: Modern, Symbolic, and Postmodern Perspectives", Hatch, M. J., & Cunliffe, A. L., 3rd,2013 , Oxford University Press.

3 "Organizational Culture and Leadership", Schein, E. H., 5th.2010, Wiley.

4 "Organizations and Organizing: Rational, Natural, and Open Systems Perspectives" , Scott, W. R., & Davis, G. F., 2015, Routledge.

23MROB03M - ORGANIZATIONAL CHANGE AND DEVELOPMENT (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MROB03M	ORGANIZATIONAL CHANGE AND DEVELOPMENT	OCD	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the theories and models of organizational change and development.	2	PO6
CO2	Analyze the process and challenges of implementing organizational change.	4	PO6, PO8
CO3	Evaluate the effectiveness of different change management strategies and interventions.	5	PO6
CO4	Formulate strategies to manage resistance and ensure successful organizational change and development.	5	PO6

Syllabus

Introduction to Organizational Change and Development: Overview of organizational change and development. Key concepts and definitions. Theories and models of change, including Lewin\'s Change Management Model, Kotter\'s 8-Step Change Model, and ADKAR Model. Case studies on organizational change.

The Change Process: Steps in the change process: identifying the need for change, planning for change, implementing change, and sustaining change. Understanding the role of change agents and leadership in the change process. Case studies on successful and unsuccessful change initiatives.

Change Interventions and Strategies: Types of change interventions: structural, technological, and behavioral. Techniques for managing change: communication, training, and development, team building, and coaching. Evaluating the effectiveness of change interventions. Case studies on different change strategies.

Managing Resistance and Ensuring Success: Identifying sources of resistance to change. Strategies for overcoming resistance: participation, negotiation, and coercion. Measuring the impact of change and ensuring sustainability. Case studies on overcoming resistance and achieving successful change.

Reference Books

1 "Organizational Change: An Action-Oriented Toolkit", Tupper F. Cawsey, Gene Deszca, Cynthia Ingols, 4th , SAGE Publications.

2 "Managing Organizational Change: A Multiple Perspectives Approach", Ian Palmer, Richard Dunford, Gib Akin, 3rd , McGraw-Hill Education.

3 "The Theory and Practice of Change Management", John Hayes, 5th, Palgrave Macmillan.

4 "Organization Development: The Process of Leading Organizational Change", Donald L. Anderson, 5th , SAGE Publications.

23MROB04M - LEADERSHIP IN ORGANIZATION (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MROB04M	LEADERSHIP IN ORGANIZATION	LIO	M	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand leadership in changing business environment	2	PO9
CO2	Apply leadership skills & tactics, appropriate style for the given situation	3	PO9
CO3	Analyze the strategic role of a leader in present day organizations	4	PO9
CO4	Make use of coaching and mentoring skills learnt for developing leaders in organizations	3	PO9

Syllabus

From Management to Leadership; Nature and Importance of Leadership; Difference between Leadership and Management; Leadership Theories; Trait Theories; Behavioral Theories; Scandinavian Studies; Contingency Approaches; Situational Theories; Servant Leadership; Adaptive Leadership.

Leadership Skills and Leadership Styles ; Leadership Skills and Tactics: Social Skills; Persuasion Skills ; Motivational Skills ; Communication and Conflict Resolution Skills ; Role Models; Story Telling; Leadership Styles; The Impact of Leadership Styles on Work Climate.

Strategic Leadership by Executives; The Nature of Strategic Leadership; How leaders influence organizational performance; Constraints on Executives; Conditions Affecting the Need for Strategic Leadership; Political Power and Strategic Leadership; Research on Effects of CEO Leadership; Strategic Leadership by Executive Teams, Women CEOs.

Leadership Development and Succession; Development through Self Awareness and Self Discipline; Development through Education; Experience and Mentoring; Leadership Development Programs; Developing next Generation Leaders; Leadership Development and Organizational Goals ; Coaching Leaders ; Leadership Succession ; Choosing the Right CEO.

Reference Books

1 Leadership in Organizations, Yulk, Gary, 2020, Pearson Education.

2 Principles of Leadership, Dubrin, Andrew J, 2017, Cengage Learning.

3 Leadership Myths and Realities, Robert J. Allio , 2000, Tata Mcgraw Hill.

4 Leadership: Theory and Practice, Peter G Northouse, 2021, Sage.

23MRPA01 - FUNDAMENTALS OF AGRONOMY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPA01	FUNDAMENTALS OF AGRONOMY	FOA	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the principles of agronomy with interdisciplinary approach with Botany, Soil Science, Irrigation, plant protection, Plant Genetics and Breeding, Agrometeorology	2	PO1, PO6, PO7, PSO3
CO2	Understand the various nutrients and their effects on plant health and irrigation measures	2	PO1, PO6, PO7, PSO3
CO3	Interpret weeds, sustainable agricultural production, and apply scientific methods and tools in field preparation	3	PO1, PO6, PO7, PSO3
CO4	Apply the impact of the professional agricultural solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	3	PO1, PO6, PO7, PSO3
CO5	Demonstrate the Identification and proper crop management practices with practical knowledge to produce food for humans.	3	PO1, PO6, PO7, PSO3

Syllabus

Introduction to Agriculture, Agronomy, Tillage and Types with modern concepts of tillage, Seed and sowing, methods and crop geometry. Objectives of tillage, Characteristics of ideal seed bed, Effect of tillage on soil properties, Types of tillage,

Plant population, soil fertility, Crop nutrition and their symptoms, manures and fertilizers and Irrigation and methods and importance with crop growth and development, Types of manures and fertilizers, Factors influencing methods and time of fertilizer application, Bio-fertilizers, Irrigation, Importance of Irrigation , Objectives of irrigation

Herbicides- Definition, advantages and limitations of herbicide usage in India.- Bioherbicides, Classification of herbicides based on chemical nature, time and method of application, Herbicidal formulations

Selectivity and resistance Selectivity of herbicides, Fundamental principles of selectivity, Differences in morphology and growth habit of plants, advantages and limitations of herbicide usage in India, Bioherbicides, Classification of herbicides based on chemical nature, time and method of application,

Visit to college farm and identification of major crops and varieties, Practice of primary tillage implements and puddling, Practice of secondary tillage implements, active ingredient- Acid equivalent- Nomenclature of herbicides, Adjuvants and their use in herbicide application, Types of adjuvants

Reference Books

1 Principles of Agronomy., Reddy, S.R. , 5th edition, 2016, Kalyani Publishers.

2 Principles of Agronomy, Yellamanda Reddy, T. and Sankara Reddi, G. H, 3, 2016, Kalyani Publishers,Ludhiana.

3 Fundamentals of Agronomy., Gopal Chandra de, 4th, 1989, Oxford & IBH Publishing Co. Pvt. Ltd. , New Delhi..

4 Modern weed management., Gupta,O.P., 5t edition, 2011, Agrobios (India), Jodhpur..

23MRPA02 - INTRODUCTORY AGROMETEOROLOGY AND CLIMATE CHANGE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPA02	INTRODUCTORY AGROMETEOROLOGY AND CLIMATE CHANGE	IACC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Estimate the behaviour of the atmosphere and agroclimatic zones.	2	PO3, PO6
CO2	Understand agrometeorology in agriculture and the changes of individual weather elements and their relation to crop production.	2	PO3, PO6
CO3	Understand the management of weather hazards for improving crop productivity	2	PO3, PO6
CO4	Demonstrate weather forecasting and impact of climate change on agriculture	3	PO3, PO6
CO5	Record and estimate and analyzing the meteorological instruments from the agro meteorological observatory.	3	PO3, PO6

Syllabus

Earth atmosphere, composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo;

Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification

Artificial rainmaking; Monsoon,mechanism and importance in Indian agriculture; Weather hazards, drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and coldwave; Agriculture and weather relations, modifications of crop microclimate, climatic normals for crop and livestock production

Weather forecasting, types of weather forecast and their uses; Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture. Practical Visit of Agrometeorological observatory, site selection of observatory, exposure of instruments and weather data recording;

Measuring the pressure of the atmosphere and analyzing atmospheric conditions, assessing wind speed and direction, and creating visualizations of wind patterns, meteorologists gain valuable insights into weather phenomena

Reference Books

1 Principles and practices of agricultural disaster management., Radha Krishna Murthy,V., 2016, B.S Publications, Koti,Hyderabad..

2 Introduction to Agriculture and Agrometeorology. , Reddy, S.R , 1. 2014., B.S Publications, Koti, Hyderabad .

3 Agrometeorology: Principles and Applications of Climate Studies in Agriculture, H.D. Singh, 9. 1994 , CRC Press.

4 Agrometeorology: A Modern Synthesis, S. Nagarajan and S.S. Dhingra , 2002 , Kluwer Academic Publishers.

23MRPA03 - GEOINFORMATICS AND NANOTECHNOLOGY FOR PRECISION FARMING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPA03	GEOINFORMATICS AND NANOTECHNOLOGY FOR PRECISION FARMING	GNPF	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Integrate about the concept of precision farming and the techniques involved in precision farming.	2	PO6, PO7
CO2	Familiarize about the applications of nanotechnology in tillage operation, seed sowing, fertilizer application, plant protection management.	2	PO6, PO7
CO3	Apply the techniques involved in soil mapping. It allows the student to learn about remote sending practical applications in the field.	3	PO6, PO7
CO4	Interpretation of the data in this course. Geo-referencing those data and classifying the supervised and unsupervised data of RS images.	3	PO6, PO7
CO5	Apply and Demonstrate and Practical Knowledge on GIS technology and Precision Farming	3	PO6, PO7

Syllabus

Precision agriculture: concepts and techniques-Issues and concerns for Indian agriculture Geo-informatics- definition, concepts, tools and techniques and their use in Precision Agriculture Crop discrimination and Yield monitoring techniques Principles and practices of precision agriculture.Application of nanotechnology in agriculture - tillage, seed, water, fertilizers, plant protection for scaling-up farm productivity

Crop discrimination and Yield monitoring, soil mapping fertilizer recommendation using geospatial technologies Spatial data and their management in GIS Geodesy and its basic principles Remote sensing concepts and application in agriculture Image processing and interpretation Global system (GPS), components and its functions Nanotechnology, definition, concepts and techniques Nano scale definition Nano-particles , materials occurrence properties Characterization of nano-materials structural characterization Nano sensors

System Simulation- Concepts and principles, Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs STCR approach for precision agriculture Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects Concepts and principles, Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs STCR approach for precision agriculture

Nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in tillage, seed, water, fertilizer, plant protection for scaling-up farm productivity.geospatial technologies Spatial data and their management in GIS Geodesy and its basic principles Remote sensing concepts and application in agriculture Image processing and interpretation Global system (GPS), components and its functions Nanotechnology, definition, concepts and techniques Nano scale definition Nano-particles , materials occurrence properties Characterization of nano-materials structural characterization Nano sensors

Reference Books

1 Remote sensing and image interpretation on Agriculture , Jonathan Chipman, Ralph W. Kiefer, Thomas Lillesand , 7 ,2015, John Wiley and Sons .

2 Remote sensing and image interpretation. , Lillesand, T.M. and Kiefer, R. W. , 2, 1994 , B.S. Publications, Hyderabad .

3 Text book of Remote sensing and Geographical Information Systems, , Anji Reddy, M., 3, 2006 , , B.S. Publications, Hyderabad. .

4 NANO: The Essentials:Understanding Nanoscience and Nanotechnolgy , Pradeep. T. , 2, 2007, Tata McGraw-Hill Publishing Company Limited, New Delhl .

23MRPA04 - PROTECTED CULTIVATION AND POST-HARVEST TECHNOLOGIES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPA04	PROTECTED CULTIVATION AND POST-HARVEST TECHNOLOGIES	PCPHT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the concepts of greenhouses, its history, greenhouse effect, types of green houses and greenhouse environment	2	PO6, PO7, PSO3
CO2	Applying the knowledge and skills to design, construct and manage the greenhouse effectively	3	PO6, PO7, PSO3
CO3	Applying the concepts of engineering properties and aero-dynamic properties to design various post-harvest equipments	3	PO6, PO7, PSO3
CO4	Analyze the drying parameters of various grains and performance evaluation of various commercial grain dryers, material handling equipments etc.	4	PO6, PO7, PSO3
CO5	Analyze the working of different types of greenhouses based on shape and performance evaluation of various post-harvest equipments	4	PO6, PO7, PSO3

Syllabus

Introduction to greenhouses, history, definition, greenhouse effect, advantages of green houses. Brief description of types of greenhouses, greenhouses based on shape, utility, construction, covering materials and cost, shade nets. Plant response to greenhouse environments i.e. light, temperature, relative humidity, ventilation and carbon dioxide and environmental requirement of agriculture and horticulture crops inside green houses. Equipment required for controlling greenhouse environment, summer cooling and winter cooling, natural ventilation, forced ventilation and

Planning of greenhouse facility, site selection and orientation, structural design and covering materials. Materials for construction of greenhouses. Design criteria and constructional details of greenhouses, construction of pipe framed greenhouses, material requirement, preparation of materials and procedure of erection. Greenhouse heating and distribution systems, greenhouse utilization, off-season drying of agricultural produce. Economic analysis of greenhouse production, capital requirement, economics of production and conditions influencing returns.

Irrigation system used in greenhouses, rules of watering, hand watering, perimeter watering, overhead sprinklers, boom watering and drip irrigation. Important engineering properties such as physical, thermal and aero-dynamic properties of cereals, pulses and oil seeds. Designing post-harvest equipment based on physical and thermal properties. Winnowing, manual and power operated winnowers, care and maintenance. Groundnut decorticators, hand and power operated decorticators, principle of working, care and maintenance

Moisture measurement, equilibrium moisture content (EMC), importance, Drying theory Drying and dehydration. Commercial grain dryers, deep bed, flat bed, tray, fluidized bed, recirculated and solar dryers will be dealt. Material handling equipment and their selection. Primary processing of cereals, pulses and oil seeds. Cleaning, grading and packaging

Familiarization with renewable energy gadgets, biogas plants, production process of biodiesel, briquetting machine - production process of bio-fuels - Familiarization with different solar energy gadgets, solar photovoltaic system, Solar light, Solar pumping, Solar fencing, solar cooker, solar drying system, solar distillation and solar pond

Reference Books

1 Greenhouse technology and management, Radha Manohar, K and Igathinathane. C., 2 (2007), BS Publications.

2 Greenhouse technology for Controlled Environment, Tiwari, G.N., 1 (2003), Narosa Publishing house Pvt. Ltd..

3 Advances in protected cultivation, Singh Brahma and Balraj Singh, 1 (2015), New India publishing company.

4 Unit operations of agricultural processing, Sahay, K.M. and Singh, K. K., 1(2004), Vikas publishing house pvt. Ltd. New Delhi..

5 Post-harvest technology of cereals, pulses and oil seeds, Chakraverty, A., 1 (2019), Oxford and IBH publishing Co. Ltd., New Delhi.

6 Principles of Agricultural Engineering, vol. I,, Ojha, T. P. and Michael, A. M., 14 (2021), Jain brothers, Karol Bag, New Delhi.

23MRPY01 - BASICS OF PHARMACOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPY01	BASICS OF PHARMACOLOGY	BOP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the pharmacological actions of different categories of drugs	2	PO1
CO2	Understand the mechanism of drug action at the organ system/subcellular/macromolecular level	2	PO1
CO3	Apply the basic knowledge of pharmacology in PNS	3	PO1
CO4	Apply the effect of drugs on CNS	3	PO1
CO5	Analyze practical applications of Pharmacology	4	PO1

Syllabus

General Pharmacology a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non-competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. b. Adverse drug reactions. c. Drug interactions pharmacokinetic and pharmacodynamic d. Drug discovery and clinical evaluation of new drugs Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance

Pharmacology of drugs acting on peripheral nervous system a. Organization and function of ANS. b. Neurohumoral transmission,co transmission and classification of neurotransmitters. c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics. d.Neuromuscular blocking agents and skeletal muscle relaxants peripheral. e. Local anesthetic agents. f. Drugs used in myasthenia gravis and glaucoma .

Pharmacology of drugs acting on central nervous system .General anesthetics and preanesthetics.Sedatives, hypnotics and centrally acting muscle relaxants. Anti epileptics . Alcohols and disulfuram .Pharmacology of drugs acting on central nervous system .Psychopharmacological agents: Antipsychotics, antidepressants, anti anxiety agents, anti manics and hallucinogens. Drugs used in Parkinsons disease and Alzheimers disease. CNS stimulants and nootropics. Opioid analgesics and antagonists. Drug addiction, drug abuse, tolerance and dependence

Reference Books

1. Rang and Dales Pharmacology, Churchil Livingstone Elsevier , Rang H. P. Dale M. M., Ritter J. M.Flower R. J, 10 (2020), Elsevier.
2. Basic and clinical pharmacology , Katzung B. G. Masters S. B.Trevor A. J , 15 (2021) , Lea& Febigur.
3. Text book of Medical Pharmacology, KD Tripathy , 9 (2019), Jaypee.
4. The Pharmacological Basis Of therapeutics , Goodman Gilman, Louis S. Goodman, Alfred Goodman, and Theodore W. Rall. , 16 (2021), Mc Graw Hill.
5. Text Book pof experimental pharmacology , Mathew, 1(2022) , Pritham.

23MRPY02 - ADVANCED PHARMACOLOGY - I (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPY02	ADVANCED PHARMACOLOGY - I	AP-I	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding Pharmacology of cardio vascular system drugs: congestive heart failure drugs, Anti-hypertensive drugs, Anti-anginal drugs, Anti-arrhythmic drugs, Antihyperlipidemic drugs	2	PO5, PO10, PSO3
CO2	Understanding the pharmacology of shock, Hematinics, coagulants and anticoagulants, Fibrinolytics and antiplatelet drugs, diuretics and autocoids	2	PO5, PO10, PSO3
CO3	Understand the Pharmacology of drugs acting on endocrine system. Anterior Pituitary hormones, Thyroid hormones, Insulin, Oral Hypoglycemic agents and glucagon, ACTH and corticosteroids.	2	PO5, PO10, PSO3
CO4	Undesrtand the principles of Bio-Assays	2	PO5, PO10, PSO3
CO5	Applying the pharmacological activity of drugs on Cardiac and Renal system and dose responses on isolated tissues (Insilco)	3	PO5, PO10, PSO3

Syllabus

Pharmacology of drugs acting on cardiovascular system Introduction to hemodynamic and electrophysiology of heart. Drugs used in congestive heart failure Antihypertensive drugs. Antianginal drugs. Anti-arrhythmic drugs. Antihyperlipidemic drugs. Pharmacology of drugs acting on cardiovascular system Drug used in the therapy of shock. Hematinics, coagulants and anticoagulants. Fibrinolytics and antiplatelet drugs. Plasma volume expanders.

Pharmacology of drugs acting on urinary system Diuretics, Antidiuretics. Autocoids and related drugs Introduction to autacoids and classification, Histamine, 5HT and their antagonists. Prostaglandins, Thromboxanes and Leukotrienes. Angiotensin, Bradykinin and Substance P. Non- steroidal anti-inflammatory agents, Antigout drugs, Antirheumatic drugs

Pharmacology of drugs acting on endocrine system Basic concepts in endocrine pharmacology., Anterior Pituitary hormones- analogues and their inhibitors. Thyroid hormones analogues and their inhibitors. Hormones regulating plasma calcium level Parathormone, Calcitonin and VitaminD. Insulin, Oral Hypoglycemic agents and glucagon. ACTH and corticosteroids

Pharmacology of drugs acting on endocrine system Androgens and Anabolic steroids. Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus. Bioassay Principles and applications of bioassay. b. Types of bioassay Bioassay of insulin, oxytocin, vasopressin, ACTH, dtubocurarine, digitalis, histamine and 5HT.

1. Introduction to in-vitro pharmacology and physiological salt solutions. 2. Effect of drugs on isolated frog heart. 3. Effect of drugs on blood pressure and heart rate of dog. 4. Study of diuretic activity of drugs using rats mice. 5. DRC of acetylcholine using frog rectus abdominis muscle. 6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus 7. abdominis muscle and rat ileum respectively. 8. Bioassay of histamine using guinea pig ileum by matching method. 9. Bioassay of oxytocin using rat uterine horn by interpolation method. 10. Bioassay of serotonin using rat fundus strip by three-point bioassay. 11. Bioassay of acetylcholine using rat ileum colon by four-point bioassay. 12. Determination of PA2 value of prazosin using rat anococcygeal muscle by Schilds plot method 13. Determination of PD2 value using guinea pig ileum. 14. Effect of spasmogens and spasmolytics using rabbit jejunum

Reference Books

1 P. Goodman and Gilmans The pharmacological Basis of therapeutics, Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, 14, 2022, Mc Graw Hill, Pergamon press..

2 Basic and clinical pharmacology Katzung, B, Katzung, B.G, 1st edition, 2010, Prentice Hall, International.

3 Essentials of medical pharmacology, Tripathi, K. D , 8th edition, 2008, Jaypee, Delhi.

4 Hand book of Experimental Pharmacology, S. K. Kulakarni, 2nd edition, 2021, Vallabh Prakashan.

23MRPY03 - EXPERIMENTAL PHARMACOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPY03	EXPERIMENTAL PHARMACOLOGY	EPC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understand the uses of various commonly used laboratory animals in preclinical research	2	PO9, PSO2
CO2	Understand the animal screening models for various indications	2	PO9, PSO2
CO3	Understand the animal screening models for nervous system related indications	2	PO9, PSO2
CO4	Understand the importance of biostatistics and research methodology in clinical and preclinical research	2	PO9, PSO2
CO5	Apply Pharmaocological screening methods to identify the activity of drugs	3	PO9, PSO2

Syllabus

Laboratory Animals: o Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals. o Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. o Techniques for collection of blood and euthanasia. o Common routes of drug administration in laboratory animals. o Dose selection, calculation and conversions, preparation of drug solution/suspensions. Grouping of animals and importance of sham negative and positive control groups

Study of screening animal models for various indications o Rationale for selection of animal species and sex for the study. o Diuretics o Anti-asthmatics o Analgesic o Antipyretic o Anti-inflammatory o Drugs acting on eye o Antihypertensives o Antiarrhythmics o Anti-dyslepidemics o Anti-aggregatory o Coagulants o Anticoagulants o Antiulcer o Antidiabetic o Anticancer

Study of screening animal models for nervous system related indications o Nootropics & Alzheimer\'s disease o Anti-Parkinson\'s o General anesthetics o Sedative and hypnotics o Antipsychotic o Antidepressant o Antiepileptic o Sympathomimetics o Sympatholytics o Parasympathomimetics o Parasympatholytics o Skeletal muscle relaxants o Local anesthetics

Research methodology and Bio-statistics o Selection of research topic o Review of literature o Research hypothesis o Study design o Pre-clinical data analysis o Interpretation using Students \'t\' test and One-way ANOVA. o Graphical representation of data

Reference Books

1 Fundamentals of Experimental Pharmacology , M. N. Ghosh , 2008, Hilton and Company .

2 Hand book of Experimental Pharmacology , S. K. Kulakarni , 2014, VALLABH PRAKASHAN .

3 Introduction to biostatistics and research methods , PSS Sundar Rao and J Richard , 2012, PHI Learning Pvt. Ltd. .

4 Drug discovery and Evaluation by , Vogel H.G. , 1996, Springer .

23MRPY04 - ADVANCED PHARMACOLOGY - II (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPY04	ADVANCED PHARMACOLOGY - II	AP-II	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases	2	PO4, PSO2
CO2	Understand the mechanism of drug action antibiotics and drugs used commonly infected diseases	2	PO4, PSO2
CO3	Understand the immunopharmacology	2	PO4, PSO2
CO4	Apply the principles of toxicology and treatment of various poisonings	3	PO4, PSO2
CO5	Apply the knowledge on introduction to experimental Pharmacology, common laboratory animals, agonist and antagonist activities of drugs on isolated tissues. Get trained on screening of anti-allergic drugs, anti-ulcer drugs and gastro intestinal activity	3	PO4, PSO2
CO6	Estimation of different biochemical parameters using semi auto analyser and obtain a knowledge on screening of hypo glycaemic drugs, Pyrogen testing, Trained in performing of toxicity studies, and get knowledge in application of Biostatistics in Pharmacological research.	3	PO4, PSO2

Syllabus

Pharmacology of drugs acting on Respiratory system a. Anti -asthmatic drugs b. Drugs used in the management of COPD c. Expectorants and antitussives d. Nasal decongestants e. Respiratory stimulants Pharmacology of drugs acting on the Gastrointestinal Tract a. Antiulcer agents. b. Drugs for constipation and diarrhoea. c. Appetite stimulants and suppressants. d. Digestants and carminatives. e. Emetics and anti-emetics.

Chemotherapy a. General principles of chemotherapy. b. Sulfonamides and cotrimoxazole. c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline andaminoglycosides d. Anti-tubercular agents e. Anti-leprotic agents f. Antifungal agents g. Antiviral drugs h.Anthelmintics i. Antimalarial drugs j. Anti-amoebic agents

Chemotherapy l. Urinary tract infections and sexually transmitted diseases. 2. Chemotherapy of malignancy. Immunopharmacology a. Immunostimulants b. Immunosuppressant Protein drugs, Monoclonal antibodies, target drugs to antigen, biosimilars

Principles of toxicology a. Definition and basic knowledge of acute, subacute and chronic toxicity. b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity c. General principles of treatment of poisoningd. Clinical symptoms and management of barbiturates, morphine, Organophosphosphorus compound and lead, mercury and arsenic poisoning. Chrono pharmacology a. Definition of rhythm and cycles. b. Biological clock and their significance leading to chronotherapy.

Reference Books

1 P. Goodman and Gilmans The pharmacological Basis of therapeutics, Goodman Gilman, A, Rall, T.W, Nies, A.I.S. and Taylor, 2022, Mc Graw Hill, Pergamon press.

2 Modern Pharmacology, Craig, C.R. and Stitzel, R.E, 2012, Little Brown and company.

3 Pharmacology, Rang, H.P. and Dale, M.M., 2023, Churchill Living stone.

4 Basic and clinical pharmacology, Katzung, B.G, 2023, Prentice Hall, International.

5 Essentials of medical pharmacology, Tripathi, K. D , 2018, Jaypee, Delhi .

23MRTP01 - INTRODUCTION TO TECHNOLOGICAL ENTREPRENEURSHIP (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRTP01	INTRODUCTION TO TECHNOLOGICAL ENTREPRENEURSHIP	ITEP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of technological entrepreneurship and the entrepreneurial ecosystem.	2	PO2
CO2	Develop skills for identifying and evaluating technological opportunities.	3	PO5
CO3	Create viable business models and strategies for technology-based startups.	4	, PSO3
CO4	Develop and pitch a technology-based business plan.	5	
CO5	Implement strategies for launching and scaling technology startups.	6	PO9

Syllabus

Introduction to Technological Entrepreneurship: Definition and significance of technological entrepreneurship, Overview of the entrepreneurial ecosystem, Characteristics of successful technology entrepreneurs

Opportunity Identification and Evaluation: Techniques for identifying technological opportunities, Market research and analysis, Feasibility studies and validation

Business Model Development: Components of a business model, Business model canvas, Case studies of successful tech startups

Business Planning and Pitching: Elements of a business plan, Financial planning and projections, Pitching techniques and investor presentations

Launching and Scaling Startups: Strategies for launching technology startups, Growth hacking and scaling techniques, Managing resources and operations

Reference Books

1 The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, 1st, Crown Business.

2 Zero to One: Notes on Startups, or How to Build the Future, Peter Thiel, Blake Masters, 1st, Crown Business.

3 Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Alexander Osterwalder, Yves Pigneur, 1st, Wiley.

4 The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail, Clayton M. Christensen, 1st, Harvard Business Review Press.

23MRTP02 - LEAN STARTUP LAUNCHPAD (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRTP02	LEAN STARTUP LAUNCHPAD	LSLP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the principles and concepts of Lean Startup methodology and explain its importance for modern entrepreneurs.	2	PO2, PO6, PSO2
CO2	Identify target customer segments, develop detailed customer personas, and validate customer problems through effective interviews and analysis.	4	PO2, PO6, PSO2
CO3	Generate innovative solution ideas, formulate testable hypotheses, and design experiments to validate these hypotheses effectively.	6	PO2, PO6, PSO2
CO4	Develop a Minimum Viable Product (MVP) with limited resources, test it with real users, and iterate based on feedback to improve the product.	6	PO2, PO6, PSO2
CO5	Develop a Minimum Viable Product (MVP) with limited resources, test it with real users, and iterate based on feedback to improve the product.	5	PO2, PO6, PSO2

Syllabus

Introduction to Lean Startup Methodology: The definition and principles of Lean Startup, the importance of Lean Startup for entrepreneurs, an overview of the Build-Measure-Learn loop, and understanding hypothesis-driven development.

Customer Discovery and Problem Validation: Identifying and segmenting target customers, developing customer personas, conducting customer interviews, and validating customer problems.

Solution Ideation and Hypothesis Testing: Generating and prioritizing solution ideas, formulating hypotheses for solutions, designing experiments to test hypotheses, and metrics and measurement in Lean Startup.

Developing a Minimum Viable Product (MVP): The definition and purpose of an MVP, types of MVPs such as prototypes and landing pages, building an MVP with limited resources, and iterating based on feedback.

Business Model Validation and Preparation for Launch: The introduction to Business Model Canvas, validating revenue models and cost structures, testing market fit and scalability, pivoting based on validation results, developing a go-to-market strategy, building a pitch deck for investors, planning for scaling and growth, and understanding common pitfalls and challenges.

Reference Books

1 The Lean Startup, Eric Ries, 1st (2011), Crown Business.

2 The Four Steps to the Epiphany, Steve Blank, 2nd (2020), K&S Ranch.

3 Running Lean, Ash Maurya, 1st (2022), O'Reilly Media.

4 Business Model Generation, Alexander Osterwalder, Yves Pigneur, 1st (2010), Wiley.

23MRTP03 - ENTREPRENEURSHIP AND VENTURE CAPITAL (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRTP03	ENTREPRENEURSHIP AND VENTURE CAPITAL	EVC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To Understand the entrepreneurial mindset and process.	2	PO5
CO2	To explore different business models and develop a viable business plan	3	PO5
CO3	To analyse the fundamentals of venture capital and the investment process	4	PO9
CO4	To gain insights into scaling startups and managing growth	4	PO9
CO5	Laboratory Experiments	4	PO9

Syllabus

Definitions and types of entrepreneurship, Characteristics of successful entrepreneurs, The entrepreneurial ecosystem, Creativity and innovation in entrepreneurship, Techniques for idea generation, Identifying and evaluating, Business model canvas, Components of a business plan, Case studies of successful startups.

Importance of market research, Methods for market analysis, Understanding customer needs and segmentation, Roles and responsibilities in a startup team, Recruitment and team dynamics, Leadership and management skills, Lean startup methodology, Minimum viable product (MVP), Iterative development and user feedback.

Overview of venture capital industry, Types of venture capital firms, Stages of venture capital funding, Preparing for fundraising, Crafting a compelling pitch, Approaching and negotiating with investors, Creating financial projections, Understanding startup valuation, Dilution and cap tables

Key components of a term sheet, Negotiating deal terms, Common deal structures, Strategies for scaling, Managing rapid growth, Operational challenges and solutions, Legal considerations for startups, Intellectual property and patents, Ethical dilemmas in entrepreneurship

Reference Books

1 he Lean Startup: How Constant Innovation Creates Radically Successful Businesses, Ries, Eric, 2011, Crown Business.

2 Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist, Brad Feld and Jason Mendelson, 2019, Wiley.

3 Entrepreneurship: Successfully Launching New Ventures, Bruce R Barringer, Duane Ireland, 2012, Pearson.

4 Strategic Management of Venture Capital, Neelkant Sharma , 2002, New Century Publications.

5 Venture deals, Brad Feld, 2019, Wiley.

23MRTP04 - BUILDING AND SUSTAINING A SUCCESSFUL ENTERPRISE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRTP04	BUILDING AND SUSTAINING A SUCCESSFUL ENTERPRISE	BSSE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze and evaluate the fundamental principles and strategic processes involved in building and sustaining a successful enterprise.	2	
CO2	Develop comprehensive market analyses and identify business opportunities using competitive analysis techniques.	3	
CO3	Apply financial management techniques, including planning, forecasting, and key financial ratio analysis, to ensure business sustainability.	4	
CO4	Design effective marketing and sales strategies, incorporating digital marketing and customer relationship management to enhance business growth.	4	
CO5	Plan, execute, and present a capstone project that demonstrates practical application of course concepts in creating and maintaining a successful enterprise.	5	

Syllabus

Foundations of Building a Successful Enterprise Introduction to Building Successful Enterprises; Key components of a successful enterprise; Overview of entrepreneurial thinking and mindset; Defining vision, mission, and goals; Strategic planning processes; Tools and techniques for strategic execution

Market Analysis and Innovation Understanding market trends and dynamics; Identifying and evaluating business opportunities; Conducting competitive analysis; Role of innovation in business success; Fostering a culture of innovation; Case studies on innovative businesses; Different types of business models; Creating and delivering value to customers; Evaluating and refining business models

Financial Management and Marketing Strategies Financial planning and forecasting; Managing cash flow and capital; Key financial ratios and their implications; Developing effective marketing strategies; Sales techniques and customer relationship management; Digital marketing and its impact on business

Leadership, Sustainability, and Capstone Project Recruitment and selection processes; Team dynamics and performance management; Leadership styles and their impact on team success; Creating and maintaining a strong organizational culture; Leading through change and uncertainty; Case studies on organizational transformation; Identifying and managing business risks; Legal aspects of running a business; Intellectual property and compliance issues; Expanding businesses internationally; Understanding global market dynamics; Strategies for entering and succeeding in foreign markets; Importance of sustainability in business; Implementing CSR initiatives

Integration and Practical Application: This module focuses on integrating the foundational concepts, analytical skills, and strategic approaches learned throughout the course. It emphasizes practical application through case studies, simulations, and project-based learning to synthesize knowledge and skills essential for building and sustaining a successful enterprise.

Reference Books

1 Entrepreneurship: Successfully Launching New Ventures, Bruce R. Barringer, R. Duane Ireland, 6th Edition, Pearson.

2 Marketing Management, Philip Kotler, Kevin Lane Keller, 15th Edition, Pearson.

3 Financial Management: Theory & Practice, Eugene F. Brigham, Michael C. Ehrhardt, 15th Edition, Cengage Learning.

4 Leadership: Theory and Practice, Peter G. Northouse, 8th Edition, SAGE Publications, Inc.

5 Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Alexander Osterwalder, Yves Pigneur, 1st Edition, Wiley.

23MRWS02 - SOIL AND WATER CONSERVATION ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRWS02	SOIL AND WATER CONSERVATION ENGINEERING	SWCE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the concepts of soil, water, and wind erosion along with their various conservation practices.	2	PO7, PO10, PSO2
CO2	Understand about terraces, contours, and grasses waterways in order to prevent erosion at different grades of slopy land	2	PO7, PO10, PSO2
CO3	Understand the concepts of irrigation water measurement and various irrigation methods - micro-irrigation, underground pipeline system.	2	PO7, PO10, PSO2
CO4	Apply knowledge in the water conservation structure, and the systems associated with wells to drive water out of them to irrigate the agricultural land	3	PO7, PO10, PSO2
CO5	Analyse the real-life problems through laboratories work.	4	PO7, PO10, PSO2

Syllabus

Introduction to soil and water conservation, Causes of soil erosion, Definition and agents of soil erosion, Water erosion, Forms of water erosion, Gully classification and control measures, Soil loss estimation by Universal Soil Loss Equation, Soil loss measurement techniques, Principles of erosion control, Introduction to contouring, Strip cropping, Contour bund, Graded bund and bench terracing, Grassed water ways and their design, Water harvesting and its techniques, Wind erosion, Mechanics of wind erosion

Types of soil movement, Principles of wind erosion control and its control measures. Introduction to irrigation, Irrigation project classification, Methods of microirrigation, Importance of irrigation water measurements, Volumetric area velocity Discharge methods, Weirs, Orifice, Flumes, Types of wells, Water lifting devices

Importance of irrigation water measurements - Volumetric, area velocity, discharge methods - Weirs, orifice, flumes.Classification of pumps, capacity, Power, Discharge calculations, Open channel hydraulics, Discharge calculations, Underground pipeline systems

Functional components and working principle of underground pipeline systems and micro irrigation systems and its design like drip, Sprinkler etc. Water harvesting techniques - Lining of ponds, tanks and canal systems

Practicing survey - Principles and educating to use pacing technique for measurement. Area calculations through chain survey - GPS demo for tracking and area measurement, Construction of contour and graded bunds. Farm pond construction and its design aspects

Reference Books

1 Introduction to Soil and Water Conservation Engineering, Mal, B. C. , 1, 1995, Kalayani Publishers, Rajinder Nagar, Ludhiana.

2 Hydrology and Soil Conservation Engineering, including Watershed Management, Ghanshyam Das., 2012, 2, 2012, PHI Learning Private Limited, New Delhi - 110001.

3 Land and Water Management Engineering, Murthy, V. V.N., 2004, 2, 2004, Kalayani Publishers, New Delhi.

4 Irrigation Theory and Practice., Michael A.M., 2007, 2, 2007, Vikas Publishing House Pvt. Ltd.

5 Soil and water conservation engineering, R suresh, 1, 2005, Standard publishers distributors.

23MRWS03 - IRRIGATION WATER MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRWS03	IRRIGATION WATER MANAGEMENT	IWM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the knowledge of irrigation water management to maximize crop yield	2	PO4, PO5, PO7, PSO2
CO2	Understand the ways to improve crop performance by evaluating the different types of irrigation methods	2	PO4, PO5, PO7, PSO2
CO3	Understand the knowledge of various irrigation methods which are more efficient to minimize the water loss and improve the water use efficiency of crop	2	PO4, PO5, PO7, PSO2
CO4	Understand the knowledge on water requirements of crops, soil-plant- relationship, Irrigation requirement, duty and delta, Irrigation efficiencies	2	PO4, PO5, PO7, PSO2
CO5	Analyze the need for efficient and effective irrigation to maximize crop yield and quality whilst making best use of the water available.	4	PO4, PO5, PO7, PSO2

Syllabus

rrigation : Definition and objectives; Water resources, Irrigation projects (major, medium & minor) in India and Andhra Pradesh; Soil - plant - water relationships: Importance - Soil a three phase disperse system- Physical properties of soil viz., Depth, Soil texture, Soil structure, Particle density, Bulk density & Porosity influencing water retention, movement & availability.; Methods of soil moisture estimation and Water retention in soil

Kinds of water in soil- Gravitational water- Capillary water- Hygroscopic water - Their importance in crop production. Soil moisture constants- Saturation capacity- Field capacity- Permanent wilting point- Available soil moisture - Hygroscopic coefficient- Theories of soil water availability. Plant-water relationships and Root characteristics. Evapotranspiration- Soil evaporation & Plant transpiration and water requirement of crops

Scheduling of irrigation- Different criteria- Soil water regime approach- Feel & appearance method, Soil moisture tension & Depletion of available soil moisture method. Climatological approach- Lysimeters & IW/CPE ratio method. Plant indices approach- Visual plant symptoms, Soil-cum-sand mini plot technique, Growth rate, Relative water content, Plant water potential, Canopy temperature, Indicator plants & Critical growth stages. Methods of irrigation - Surface, Subsurface, Sprinkler and Drip irrigation

Irrigation efficiency and Water use efficiency- Crop water use & Field water use efficiency- Factors influencing WUE ; Quality of irrigation water- Salinity hazard, Sodium hazard, Residual sodium carbonate & Boron toxicity- Criteria & threshold limits- Management practices for using poor quality water. Water logging- causes for waterlogging- Agricultural drainage- Surface & Subsurface drainage systems- Relative merits.

Practical Measurement of bulk density, study of soil moisture measuring devices, determination of field capacity and permanent wilting point, measurement of infiltration rate, irrigation water, scheduling of irrigation by IW/CPE ratio method, calculations on soil moisture, irrigation water needs, duty of water and irrigation efficiencies, layout of surface methods of irrigation, demonstration of drip and sprinkler irrigation, visit to micro irrigation systems in farmers fields ,water management practices in different crops.

Reference Books

1 Irrigation Theory and Practice, Michael A M, 2 nd, 2008, Vikas Publishing House Pvt Ltd.

2 .Irrigation Agronomy , S R reddy and G K Reddy, 5th, 2019, Kalyani Publishers.

3 Efficient use of irrigation water, Reddy and Reddy, 1st, 2005, Kalyani publishers.

4 Irrigation Water Management- Principles and Practices, Dilip Kumar Majumdar, 2nd, 2013, Prentice Hall India Learning Private Limited.

23MRWS04 - RAINFED AGRICULTURE AND WATERSHED MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRWS04	RAINFED AGRICULTURE AND WATERSHED MANAGEMENT	RAWM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand about rainfed agriculture and its problems and prospects in India.	2	PO2, PO6, PO7, PSO2
CO2	Explain different tillage practices for rainfed crops, losses due to erosion, management of rainfed crops	2	PO2, PO6, PO7, PSO2
CO3	Apply different harvesting structures, conservation measures, use of fertilizers in rainfed areas and the different cropping systems in rainfed region	3	PO2, PO6, PO7, PSO2
CO4	Interpret about contingent crop planning, evapotranspiration and land capability classification	3	PO2, PO6, PO7, PSO2
CO5	Apply practical knowledge on cropping pattern of dryland areas, cultural practices in dryland areas, watershed and rainfall analysis	3	PO2, PO6, PO7, PSO2

Syllabus

Rainfed agriculture definition, dimensions of the problem, History of rainfed agriculture, watersheds in India, Problems and prospects of rainfed agriculture in India, Problems and prospects of rainfed agriculture in India soil characteristics soil fertility status soil moisture storage and retention capacity heavy weed infestation-soil crust and their effect on crop growth and soilsits management.

Tillage for rainfed crops, setline cultivation, modern concepts of tillage, Soil erosion, losses due to erosion, nature and extent of wind and water erosion, factors affecting erosion and universal soil loss equation, Water harvesting importance, its techniques Water harvesting structures arid region runoff farming water spreading

Water harvesting, importance, its techniques, Water harvesting structures, farm ponds, check dams, percolation tank, In-situ moisture conservation measures, mulching, Broad Bed and Furrow and leveling, In-situ moisture conservation measures ,bund forming bunding, ridge and furrow system conservation furrows inter plot water harvesting, mulching Broad Bed and Furrow (BBF) and leveling.

Contingent crop planning for aberrant weather conditions in red and black soils, Evapotranspiration, measures to reduce evapotranspiration, Fertilizer use in rainfed areas use of organic manures introduction of legumes in crop rotation organic recycling and bio-fertilizer use in rainfed agriculture time and method of fertilizer application

Study on weeding, use of mulches, chemicals, windbreaks and shelterbelts Land capability classification and alternate land use system Efficient utilization of water through soil and crop management practices agronomic measures mechanical measures for soil and water conservation gully control

Reference Books

1 Dryland Agriculture, Reddy, S. R. and Prabhakar Reddy, G. , 3, 2015, Kalyani Publishers. .

2 Crop Production in Dry Regions (Vol.I),, Arnon,I., 4, 1972, Leonard Hill Pub. Co, London..

3 Watershed Management in India, Dhruva Narayana, V.V., Sastry, G.S. and Patnaiak, V.S., 5, 1999, CAR, New Delhi..

4 Dryland Agriculture in India: An agro-climatological and agro-meteorological perspective. , Jeevananda Reddy,S., 5, 2002, B S publications.

23MT2007 - RANDOM VARIABLES AND STOCHASTIC PROCESS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MT2007	RANDOM VARIABLES AND STOCHASTIC PROCESS	RVASP	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Mathematical models of random phenomena and solve probabilistic problems.	3	PO1
CO2	Analyze different types of random variables and compute statistical parameters of the random variables.	4	PO1, PO2
CO3	Apply random processes in the time domain and model time varying linear systems.	3	PO2, PO3
CO4	Analyze random processes in frequency domains and model spectral characteristics of LTI systems.	4	PO4

Syllabus

THE RANDOM VARIABLE AND MULTIPLE RANDOM VARIABLES: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties. Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATION ON ONE AND MULTIPLT RANDOM VARIABLE EXPECTATIONS: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychevs Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable. OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

RANDOM PROCESSES TEMPORAL CHARACTERISTICS The Random Process Concept, Classification of Processes, Deterministic and Non deterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, Nth order and Strict Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

RANDOM PROCESSES SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Auto correlation Function, The Cross Power Density Spectrum, Properties. Random Signal Response of Linear Systems: System Response Convolution, Mean and Mean squared Value of System Response, Auto correlation Function of Response, Cross Correlation Functions of Input and Output.

Reference Books

1 Probability, Random Variables & Random Signal Principles, Peyton Z.Peebles, 4 (2001), TMH.

2 Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha, 4(2002), PHI.

3 Schaum's Outline of Probability, Random Variables, and Random Processes, Hwei P. Hsu, 4, Schaum's Outline.

4 An Introduction to Random Signals and Communication Theory, B.P.Lathi, 2 (1968), International Textbook.

5 Probability Theory and Random Processes, P. Ramesh Babu, 3 (2015), McGrawHill.

23SC1101 - COMPUTATIONAL THINKING FOR STRUCTURED DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	CTSD	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Develop and apply logical building blocks to solve real world problems	3	PO1, PO2
CO2	Apply computational thinking for designing solutions	3	PO1, PO2, PO4
CO3	Develop and apply the CRUD operations on arrays	3	PO1, PO2, PO4
CO4	Apply CRUD operations on Linear Data Structures	3	PO1, PO2
CO5	Apply the structured programming paradigm with logic building skills onBasic and Linear Data Structures for solving real world problems	3	PO1, PO2, PO4
CO6	Skill the students in such a way that students will be able to develop logicthat help them to create programs as well as applications in C	3	PO1, PO2, PO4

Syllabus

Structured Programming Paradigm: Problem Solving Approach, Algorithms and flowcharts, Program Development Steps, Structure of C Program, Pre-Processor Directives, Design of Building Blocks for solving real world problems: Data Types: Primitive, Extended and Derived, user defined data types Including Pointers, Modularizing problems using Functions, Scope of Variables and Storage classes

Operators: Types of operators, Precedence, Associativity, User I/O: Formatted I/O, Command line arguments, Redirecting I/O: Files and File Operations. Logic Design for Computational Thinking: Control Flow Statements: Decision Making using conditional statements, Definite and indefinite Iterative statements. Logic building using complex building blocks

Recursion, Strings and string manipulations, Arrays, 2-D Array, CRUD operations on Arrays, Strings, Dynamic Memory Allocation Searching: Linear Search and Binary Search Sorting: Bubble Sort

Structures, Array of Structures, structure pointers, CRUD operations on Linear Data Structures: Stacks, Queues, Single Linked List, Introduction to nonlinear data structures.

Reference Books

1 The C Programming Language: ANSI C Version, Brian W. Kernighan, Dennis M. Ritchie, 2nd Edition-2005, Prentice-Hall/Pearson Education.

2 Fundamentals of Data structures in C, Horowitz, Sahni, Anderson Freed, 2nd Edition-1995, Pearson Education.

3 Programming in ANSI C, E. Balagurusamy, 8th Edition-2015, Tata McGraw-Hill Education.

4 Data structures and Program Design in C, Robert Kruse, C. L. Tondo, Bruce Leung, Shashi Mogalla, 2006- 4th Edition, Pearson Education.

23SGT3101R - DISTRIBUTED ENERGY RESOURCES AND SMART GRIDS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SGT3101R	DISTRIBUTED ENERGY RESOURCES AND SMART GRIDS	DERSG	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the impact of DERs and smart grids on traditional systems, contributing to decentralization and reducing transmission losses	3	PO1, PO4, PSO1
CO2	Analyze distributed energy resources considering load demand, renewable sources, and grid interconnection.	4	PO4, PO6, PSO2
CO3	Analyze smart grid technologies for optimizing energy efficiency, reliability, and sustainability.	4	PO1, PO5, PSO2, PSO3
CO4	Analyze Smart Grid Monitoring and AMI Infrastructure for enhanced grid management, efficiency, and consumer engagement.	4	PO2, PO4, PSO1
CO5	Analyze and test distributed energy resources for their integration, performance, and impact on the grid.	4	PO2, PO5, PSO1
CO6	Use simulation tools to analyze distributed energy systems for accurate prediction, optimization, and decision-making.	4	PO2, PO5, PSO2, PSO3

Syllabus

Distributed Energy Resources: Introduction, combined heat and power (CHP) systems, solar photovoltaic (PV) systems, Wind energy conversion systems (WECS), small-scale hydroelectric power generation, batteries, ultra-capacitors, flywheels.

Integration of Distributed Generation to Grid: Introduction, concepts of micro grid, typical micro-grid configurations, AC and DC micro grids, interconnection of micro-grids, protection and control issues in micro-grids,

Introduction to Smart Grid: Introduction to smart grid, architecture of smart grid, smart grid standards and policies, smart grid components, smart grid technologies.

Smart Grid Monitoring: Load dispatch centers, wide area monitoring system (WAMS), PMU; Smart sensors/telemetry, advanced metering infrastructure (AMI);smart metering; demand side management.

Reference Books

1 Renewable Energy Technologies: Simulation and Economic Evaluation, Anoop Singh and Ashwani Kumar, 2013, CRC Press.

2 Smart Grid Technology, S.N. Singh, 2013, PHI Learning Pvt. Ltd.

3 Smart Grid: Fundamentals of Design and Analysis, James Momoh, 2012, IEEE Computer Society Press .

4 Smart Grid: Technology and applications, EkanayakeJ.,Jenkins N, Liyanage , Wu, J, Yokoyama A., 2012, Wiley Publications.

23SGT3406M - SMART METERS AND SMART CITIES (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SGT3406M	SMART METERS AND SMART CITIES	SMSC	M	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the historical development and transformation of traditional power grids into smart grids.	2	PO3, PO4, PSO1
CO2	Apply the key standards and initiatives relevant to smart city development and effectively apply them to enhance urban infrastructure and services.	3	PO3, PO5, PSO1
CO3	Analyze the principles of Energy Management Systems (EMS), Demand Side Management (DSM) and their roles in optimizing smart grid operations and energy efficiency.	4	PO3, PO4, PSO2
CO4	Analyze the functionalities of smart meters and assess their benefits in enhancing energy management and efficiency within smart city infrastructures.	4	PO3, PO5, PSO3

Syllabus

Smart Grid and Distribution System Architecture - Introduction to Smart Grid - Evolution of Electric Grid-Definitions and Need for Smart Grid -Smart grid drivers, functions, opportunities, challenges and benefits- Initiatives for Smart

Smart CitiesIntroduction and Characteristics of Smart Cities- Planning, Designing and Implementation of Smart Cities-Smart Cities Standards and Initiatives- Challenges and Success Factors-Smart City case study

Energy Management Systems and Demand Side Management Work Contents of DSM Implementation by Power Grid Enterprises-Condition for Promoting Power Grid Enterprises to Actively Develop DSM Program

Advanced Metering Infrastructure AMI Types of Loads, Evolution , Benefits and needs of Smart metering and AMI ,Protocols,Security ,Home local area networks HANs , NAN,WAN, Data concentrator,Meter Data Management Systems MDMS,Operational Gateways

Reference Books

1 Smart Cities: Foundations, Principles, and Application, HafizurRahaman and Muhammad Mostafa Monowar, 2017, John Wiley & sons Limited .

2 Smart Grid: Fundamentals of Design and Analysis, James Momoh, 2012, IEEE Computer Society Press .

3 Smart Cities, Claude Rochet, 2012, Wiley.

4 The Smart Grid: Enabling Energy Efficiency and Demand Response, Clark W. Gellings, 2014, CRC Press.

23SGT3507 - INTERNET OF THINGS AND SMART GRID ANALYTICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SGT3507	INTERNET OF THINGS AND SMART GRID ANALYTICS	IOT&SGA	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the network protocols and standards, and apply this knowledge to design and maintain efficient and secure communication networks.	2	PO1, PO5, PSO1
CO2	Apply the architectures of IoT systems and data analytics frameworks to optimize data collection, processing, and utilization for enhanced decision-making and operational efficiency.	3	PO2, PO6, PSO2
CO3	Analyze the various applications of IoT technologies in smart grids to enhance monitoring, control, and optimization of energy distribution and consumption.	4	PO5, PSO3
CO4	Analyze the principles and applications of big data analytics to extract valuable insights, optimize decision-making processes, and enhance operational efficiency across various domains.	4	PO4, PSO3

Syllabus

Networking Protocols and Standards for Internet of Things: Introduction, IoT Data Link Protocols, Network Layer Routing Protocols, Network Layer Encapsulation Protocols, Session Layer Protocols, IoT Management Protocols, Security in IoT Protocols, IoT Challenges.

IoT Architecture: Introduction, Architectural Approaches, Business Architecture, Functional Architecture, Application Architecture, Data and Analytics Architecture, Technology Architecture, Security and Governance.

Applications of IOT to Smart Grid: Energy monitoring, energy harvesting, smart parking, smart medium access in mobile IOT.

Introduction to Big Data Analytics: Attributes of Big Data: Volume of data, velocity of data, variety of data; Overview of big data analytics, benefits of big data analytics, big data analytics for smart grids, big data analytics tools. Smart Grid Data Management and Applications: Smart Meter Data Management: Smart metering architecture, challenges and opportunities, smart meter data management, future trends and issues; PHEVs: Internet of Vehicles: Convergence of PHEVs and internet of vehicles, electric vehicles management, future trends and issues; Smart Buildings: Concept of smart buildings, challenges and opportunities, different approaches for establishing smart buildings, future trends and issues.

Reference Books

1 Smart Grid in IoT-enabled Spaces: The Road to Intelligence in Power, Al-Turjman, Fadi, 2020, CRC Pres.

2 Smart Grid Technology: A Cloud Computing and Data Management Approach, Misra, Sudip, and Samaresh Bera, 2018, Cambridge University Press.

3 . Internet of things and data analytics handbook, Geng, Hwaiyu, ed, 2017, John Wiley & Sons.

4 Internet of Things and Big Data Analytics for Smart Generation, Valentina E. Balas, Sangeeta Mohanty, Raghvendra Kumar, Rajshree Srivastava, 2019, Springer.

23SMF3405M - ROBOTICS & INDUSTRIAL AUTOMATION (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SMF3405M	ROBOTICS & INDUSTRIAL AUTOMATION	RIA	M	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the role of robotics and its classification and anatomy suitable in Industrial Automation	2	PO3, PSO2
CO2	Apply the concepts of real time sensors used in Industrial automation to check the various physical parameters	3	PO3, PSO2
CO3	Apply the concepts of various Control strategies used to control the process of automation in various industries.	3	PO3, PSO2
CO4	Apply the concept of PLC and ladder programming concept to control the Industrial automation.	3	PO3, PSO2

Syllabus

Robotics: science fiction origins, industrial revolution impact, history, need, definition, terminology, types, and applications. Current status and future trends. Introduction to industrial automation, control, and system architecture.

Measurement Systems Specifications, Temperature measurement - RTD, Thermocouple and Pyrometers, Pressure Measurements: Low Pressure maesurement devices and dead weight tester, Force measurements- Load cells and other types, Displacement Measurement: LVDT, Potentometers, Speed measurement- Tachometers , Flow measurement techniques, Measurement of Level,

Introduction to Process Control, P-I-D Control, Controller Tuning, Implementation of P-I-D Controllers, Special Control Structures: Feedforward and Ratio Control, Predictive Control, Control of Systems with Inverse Response, Cascade Control, Overriding Control, Split Range Control.

Introduction to PLC, Need of PLC in Designing, Architecture of PLC, Ladder Programming, latching, logic gates uesd in PLC, Types of timers, Counters, data handling operations, Application and Advantage of PLC, Automation Concept and Basic Design, PLC Programming.

Reference Books

1 Industrial Instrumentation, Control and Automation , S. Mukhopadhyay, S. Sen and A. K. Deb , 2013 , Jaico Publishing House,.

2 Automation, Production Systems and Computer Integrated Manufacturing , Mikell Groover , 2018, Pearson Education .

3 Programmable Logic Controllers: Principles and Applications , Glen A. Mazur, William J. Weindorf, 2021, ATP.

5 Chemical Process Control, An Introduction to Theory and Practice , George Stephanopoulos , 2006, Prentice Hall India .

23SMF3507 - MACHINE TO MACHINE COMMUNICATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SMF3507	MACHINE TO MACHINE COMMUNICATION	MMC	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Identify the main challenges associated with M2M and sensors	3	PO2, PO5, PSO1
CO2	Understand main standards, protocols, algorithms, and research activities for machine to machine communication with sensors	3	PO2, PO3, PSO2
CO3	Apply protocols to develop machine to machine communication and to understand Hardware interfaces in a sensor network	3	PO5, PSO3
CO4	Analyze and evaluate different protocols and technologies utilized in machine-to-machine communication systems	4	PO1, PO5

Syllabus

Introduction to M2M: Overview, current landscape, early implementations, architecture, protocols, requirements, and high-level architectural principles of M2M communications.

High-Level Architecture Principles for M2M Communications: Service architectures, ETSI TC M2M Service Capabilities Framework, service capabilities, resource-based communication, and procedures.

M2M Terminals and Modules: Hardware interfaces include Power, USB, UART, Antenna, UICC, GPIO, SPI, I2C, ADC, PCM, and PWM.

Analyze and evaluate protocols and technologies in M2M communication systems: architecture, protocols, technologies, standards, implementation, and performance assessment.

Reference Books

1 M2M Communications - A System Approach , D. Boswarthick, O. Elloumi, and O. Hersent , 1st, Wiley .

2 Machine-to-Machine (M2M) Communications- Architecture, Performance and Applications , C. Anton-Haro, M. Dohler , 3rd, Woodhead Publishing ISBN 978-1-78242-102-3 .

3 Building the Internet of Things with IPv6 and MIPv6 The Evolving World of M2M Communications , D. Minoliauth , 2nd, Wiley .

4 Machine-to-Machine CommunicationsArchitectures, Technology, Standards, and Applications , Vojislav B. Misic, Jelena Misic , 2nd, CRC Press .

24EC1101 - FUNDAMENTALS OF IOT AND SENSORS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24EC1101	FUNDAMENTALS OF IOT AND SENSORS	FIS	R	2	0	4	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the basic concepts of IoT and its implementation using the Development Hardware.	3	PO2, PO5, PSO3
CO2	Apply the different sensors interfacing with Development Hardware.	3	PO2, PO5, PSO3
CO3	Apply the different actuators interfacing with Development Hardware.	3	PO2, PO5, PSO3
CO4	Analyze the IoT concepts to solve real time insights using Arduino / ESP32.	4	PO2, PO5, PSO3
CO5	Analyze the concepts of IoT devices and systems by examining how they interface with sensors, actuators, and cloud platforms.	4	PO2, PO5, PSO2, PSO3

Syllabus

The Internet of Things (IoT) connects devices to create smart applications, using architectures for seamless data exchange and development hardware like microcontrollers. Within digital circuits, ICs such as the 74LS153 multiplexer, which selects one input from many, and the 74155 de-multiplexer, which routes a single input to multiple outputs, are crucial. The SN74LS148 encoder converts multiple inputs into a binary code, while the 74LS138 decoder translates binary input into specific outputs. Arduino simplifies projects by offering versatile boards like the Arduino Uno, Nano, and Mega, along with a user-friendly Integrated Development Environment (IDE), making coding and uploading programs easy. This combination of IoT and Arduino enables a wide range of applications from home automation to interactive systems.

Temperature sensors, including thermistors and LM35, are classified by their types and interfacing methods, allowing accurate temperature measurements. Light-dependent resistors, infrared sensors, PIR sensors, ultrasonic sensors, and gas sensors each have specific interfacing techniques and are implemented in various applications to detect light, motion, distance, and gas levels, respectively. These sensors are crucial for creating responsive and intelligent systems, providing essential data for monitoring and control in diverse fields such as home automation, security, environmental monitoring, and industrial automation.

Actuators convert electrical signals into physical movement, interfacing with systems to perform specific tasks. Types of actuators include DC motors, which are used in applications requiring continuous rotation; servo motors, ideal for precise control in robotics and automation; and stepper motors, which offer accurate positioning in industrial machinery. Motor driver circuits facilitate the control of these motors, while relays and optocouplers provide safe and efficient switching mechanisms, ensuring proper isolation and operation within electronic and electromechanical systems.

Microcontrollers offer features like GPIO programming, enabling interaction with various components through specific pin configurations. Display interfacing involves 7-segment displays, which come in different types, and LCDs, each requiring detailed pin descriptions and commands for proper operation. IoT case studies demonstrate practical applications such as home automation, smart irrigation, and smart healthcare, showcasing how these technologies enhance efficiency and convenience in everyday life. Self-learning topics include smart lighting, intrusion detection, smoke detectors, smart parking, and air pollution monitoring, highlighting the broad scope of IoT innovations.

Reference Books

1 Internet of things(A-Hand-on-Approach) , Arshdeep Bahga and Vijay Madisetti, 1st edition , 2015, Universities Press.

2 Internet of Things , Rajkamal, 2012, Tata McGraw Hill .

3 Internet of Things Architectures, Protocols and Standards, Simone Cirani , Gianluigi Ferrari,Marco Picone,Luca Veltri, 1st edition,2019, Wiley Publisher.

4 The Internet of Things: Key applications and Protocols , Olivier Hersent, David Boswarthick, Omar Elloumi , 2012, Wiley Publisher .

5 The Internet of Things: Connecting Objects , Hakima Chaouchi , 2013, Wiley Publisher .

24MT1002 - DISCRETE MATHEMATICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24MT1002	DISCRETE MATHEMATICS	DMS	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context	3	PO1, PO5, PSO1
CO2	Apply formal methods of symbolic propositional logic, such as calculating validity of formulae and computing normal forms.and each of the proof techniques correctly in the construction of a sound argument.	3	PO1, PO5, PSO1
CO3	Analyze a problem to determine underlying recurrence relations.	3	PO1, PO5, PSO1
CO4	Model a variety of real-world problems in computer science using appropriate forms of graphs and trees, such as representing a network topology or the organization of a hierarchical file system.	3	PO1, PO5, PSO1

Syllabus

Sets, Relations, and Functions: Methods for describing a set, e.g., listing elements, set builder notation,Venn diagrams,Union, intersection, set difference, complement,Cartesian product,Power sets,Cardinality of finite sets. Relations:Reflexivity, symmetry, antisymmetry, transitivity,Equivalence relations, partial orders.Functions:Domain, target, and range/image of a function, Surjections, injections, bijections,Inverses,Composition.

Basic Logic:Propositional logic,Logical connectives,Truth tables,Disjunctive normal form,Validity of a well-formed formula,Propositional inference rules (e.g., modus ponens, modus tollens),Universal and existential quantifiers and their negations. Proof Techniques: Notions of implication, double implication, equivalence, converse, inverse, contrapositive, negation, and contradiction, The structure of mathematical proofs,Direct proofs,Disproving by counterexample,Proof by contrapositive,Proof by contradiction,Induction over natural numbers,Weak and strong induction (i.e., First and Second Principle of Induction),Recursive mathematical definitions,Well orderings.

Basics of Counting:Counting arguments,Set cardinality and counting,Sum and product rules,Inclusion-exclusion principle,Arithmetic and geometric progressions,The pigeonhole principle,Permutations and combinations,Basic definitions,Solving recurrence relations,An example of a simple recurrence relation, such as Fibonacci numbers,Other examples, showing a variety of solutions.

Graphs Basics, Graph Types, Graph Models, Graph Representation, Graph Isomorphism, Connectivity in Graphs, Euler and Hamiltonian Path and Circuits, Matching Theory, Shortest Path Algorithm, Travelling Salesman Problem, Graph Coloring. Trees: Introduction and Applications, Tree Traversals, Spanning Trees, Minimum Spanning Trees

Reference Books

1 Discrete Mathematics for Computer Scientists and Mathematicians,, .Joe L Mott, Abraham Kandel, Theodore P Baker, , Second Edition, 2008, Printice Hall of India.

2 Discrete Mathematical Structures with Applications to Computer Science,, . Tremblay J P and Manohar R, , 1st edition, 2001,India., Tata McGraw Hill publishers, 1st edition, 2001,India..

3 Discrete mathematics and its applications, Kenneth H. Rosen, 2022, McGraw Hill Publication.

4 Discrete Mathematical Structures,, Bernard Kolman, Robert Busby, Sharon C. Ross,, Sixth Edition 2015, Pearson Publications,.

24SC1203 - DATA STRUCTURES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SC1203	DATA STRUCTURES	DS	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand various sorting algorithms and analyse the efficiency of the algorithms.	3	PO1, PO2
CO2	Implement and evaluate Linear Data Structures and Demonstrate their applications.	3	PO1, PO2, PO3, PSO1, PSO2
CO3	Implement and evaluate tree data structures and understand hashing techniques	3	PO1, PO2, PO3, PSO1, PSO2
CO4	Understand graph data structures and apply graphs to solve problems	2	PO1, PO2
CO5	Design, Develop and evaluate common practical applications for linear and nonlinear data structures.	3	PO3, PSO1, PSO2
CO6	Skill the students in such a way that students will be able to develop logic that help them to create programs on both linear and non-linear datastructuresand its applications.	3	PO3, PSO1, PSO2

Syllabus

Algorithm Analysis: Mathematical BackgrounModel, Analyze, Running Time Calculations. Sorting: Introduction to Sorting Algorithm, Insertion Sort, Shell sort, Heap sort, Merge sort, Quick sort, Bucket Sort, External Sorting.

Dynamic Memory implementation of linear data structures: Singly Linked list, doubly linked list, circularly linked list, Applications of data structures: Polynomial Manipulation, Implementation of Stacks and Queues using Linked Lists, Circular Queue, Deque(Double ended queue), Applications of Stacks and Queues. Priority Queues (Heaps): Model, Simple Implementations, Binary Heap, Applications of Priority Queues.

Hashing: Introduction to Hashing, Hash Function, Separate Chaining, Hash Tables without Linked Lists, Rehashing, Hash Tables in the Standard Library, Extendible Hashing. Trees: Introduction to trees, Binary Trees, Tree Traversals, The Search Tree: Binary Search Trees, AVL Trees, Splay Trees, B-Trees, Red black trees.

Understand graph data structures and apply graphs to solve problems

Reference Books

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2010 , Second Edition, PearsonEducation., Mark Allen Weiss,, Second Edition, , Pearson Education.
2. Fundamentals of Data Structures in C:, Ellis Horowitz, Second Edition, Pearson Education.
3. Data Structures And Algorithms, A.V.Aho, J. E. Hopcroft, and J. D. Ullman,, Pearson Education,, First Edition Reprint2003.
4. Fundamentals of datastructures in C, Horowitz, Sahni, Anderson Freed , Second Edition, Pearson Education..
5. Data Structures, R. F. Gilberg, B. A. Forouzan, Second Edition, Thomson India Edition.

24SC2105R - COMPUTATIONAL THINKING FOR OBJECT-ORIENTED DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SC2105R	COMPUTATIONAL THINKING FOR OBJECT-ORIENTED DESIGN	CTOD	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Object oriented paradigm for code reusability	3	PO1, PO2, PO4, PO6
CO2	Design object-oriented solutions to the real-world problems through SOLID design principles	3	PO1, PO2, PO4, PO6
CO3	Design object-oriented solutions to the real-world problems through SOLID design principles	3	PO2
CO4	Demonstrate Exception handling and String manipulation techniques	3	
CO5	Design solutions to real time problems by using object-oriented programming concepts.	3	
CO6	Design GUI based applications for real time problems	3	

Syllabus

Introduction: Understanding Object oriented programming paradigm vs Structured paradigm. Advantages of Object Oriented Programming and its features- abstraction, encapsulation, inheritance & polymorphism. Java program hierarchy and compilation process. Building static methods. Primitive Data Types and Arrays as a reference data type. Access specifiers for methods. Logic building using control statements and iterative statements. Wrapper classes and Type casting (Implicit & Explicit). Command Line Arguments.

Classes and Objects: object, class vs object and object instantiation. Abstraction and encapsulation using accessors and mutators. constructors- default, parameterized, user defined, Introduction to Java API, Scanner class, console-based IO, Constructor chaining, this keyword, array of objects, aggregation vs composition, ArrayList, SOLID design principles. Inheritance, method overriding, dynamic polymorphism, dynamic method dispatch, Singleton classes. Inner classes.

Exception handling & File IO: Introduction to exceptions & errors, Java API for exceptions, try, catch, finally, throw and throws keywords, try with resources, user defined exceptions. File IO, byte streams, character streams, wrapper classes for Object IO using serializable. Strings: String based algorithms using StringBuffer and String Builder, String constant pool, regex, garbage collection.

Abstraction & Applications: Abstract classes, abstract methods, final keyword for methods and classes, template pattern, Introduction to interfaces, Interfaces vs implementation, Factory classes, factory method pattern, Generic classes, application of interfaces to build abstract data structures, Java API for Vector and Hash set and Hash Map, comparable, comparator and cloneable, iterator interfaces. Anonymous classes, Decorator pattern. Event driven programming with event listeners.

Reference Books

1 Introduction to Java Programming, Comprehensive Version , Y. Daniel Liang , 10th Edition , PHI.

2 The Complete Reference Java , Herbert Schildt , 7th edition , TMH.

3 An Introduction to Object-Oriented Programming , Timothy A. Budd , 3rd Edition, Pearson.

4 JAVA HOW TO PROGRAM, Deitel&Deitel, 11th Edition, Pearson.

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Minor Skill Development Courses (MSDC)

23MRAC05 - AI APPLICATIONS FOR BUSINESS SUCCESS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAC05	AI APPLICATIONS FOR BUSINESS SUCCESS	AIA	M	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of AI and its applications in various business domains.	2	PO5
CO2	Analyze business problems and identify suitable AI techniques and algorithms for solution development.	3	PO4, PO5, PSO1
CO3	Implement AI solutions using programming languages and frameworks commonly used in business applications.	4	PO5
CO4	Evaluate the effectiveness and impact of AI applications on business success, including ethical and societal considerations.	5	PO5

Syllabus

Introduction to AI in Business: Overview of artificial intelligence and its branches. Applications of AI in business functions such as marketing, finance, operations, and human resources. Exploration of AI trends and future outlook. Case studies showcasing successful AI implementations in various industries.

AI Techniques for Business: In-depth study of machine learning algorithms including regression, classification, clustering, and neural networks. Introduction to reinforcement learning and its applications in business decision-making. Discussion on advanced AI techniques such as deep learning and generative adversarial networks (GANs).

Implementing AI Solutions: Practical implementation of AI solutions using popular programming languages for AI development such as Python and R. Hands-on experience with AI frameworks and libraries including TensorFlow, Keras, and PyTorch. Real-world projects focusing on building AI models for business applications.

AI Impact and Ethical Considerations: Evaluation of the impact of AI on business success, including ROI assessment and performance metrics. Discussion on ethical considerations in AI development and deployment, including bias mitigation and fairness. Exploration of societal impacts of AI adoption and responsible AI practices for sustainable business growth.

Reference Books

1 "Artificial Intelligence: A Modern Approach" , Stuart Russell, Peter Norvig, 3rd , Pearson.

2 "Python Machine Learning" , Sebastian Raschka, Vahid Mirjalili, 3rd, Packt Publishing.

3 "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" 2nd O'Reilly Media, Aur?lien G?ron, 2nd , O'Reilly Media.

4 "Machine Learning Yearning" , Andrew Ng , 1st , Self-published.

23MRAG05 - DIGITAL ART (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRAG05	DIGITAL ART	DTA	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Students will be able to identify key tools and features of digital art software (e.g., Adobe Photoshop, Illustrator) and recall fundamental digital art terminology.	2	PO1
CO2	Apply Students will be able to use digital art software to create original artworks, applying techniques such as digital painting, photo manipulation, and vector illustration.	2	PO2
CO3	Analyze Students will be able to critique digital artworks by breaking down the elements and principles of design used, assessing the effectiveness of the techniques and tools employed.	3	PO3
CO4	Create Students will be able to develop a portfolio of digital artworks that showcases their ability to integrate various techniques and tools creatively, demonstrating a personal style and artistic vision.	3	PO4
CO5	Evaluate Students will be able to assess the quality and impact of digital artworks, including their own and others\', using established criteria and providing constructive feedback aimed at improving artistic techniques and conceptual expression.	4	PO5

Syllabus

Introduction to digital art software, basic tool usage, and simple projects.

Creating digital sketches, developing digital paintings, and exploring various illustration styles.

Photo retouching, color correction, blending techniques, and creating composites.

Pen tool mastery, working with shapes and paths, typography, and logo design,Designing logos, creating vector illustrations, and developing infographics.

Advanced project work, developing a cohesive portfolio, and peer reviews,3D modeling basics, animation, interactive media, and portfolio presentation.

Reference Books

1 Digital Art Masters, 3dtotal Publishing, 2nd, 3dtotal Publishing.

2 Digital Painting Techniques, 3dtotal Publishing, 1st, 3dtotal Publishing.

3 A Complete Guide for Fine Artists, Photographers, and Digital Designers, Sylvie Covey, 1st, by Sylvie Covey.

4 The Adobe Illustrator WOW, by Sharon Steuer, 2nd, by Sharon Steuer.

23MRBA05M - LOGISTICS AND SUPPLY CHAIN MANAGEMENT (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRBA05M	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	LSCM	M	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the Importance of logistics, Logistics - A systems concept	2	PO1, PSO1
CO2	Analyze about logistics as a part of supply chain management	4	PO2
CO3	Understand the modes of transportation, inbound logistics, and outbound logistics	2	PO3, PSO2
CO4	Understand about warehousing activity	2	PO4

Syllabus

Definition of Logistics Management, Functions and Objectives, Importance of logistics, Logistics-A systems concept, Logistics and customer service: Elements of customer service, Phases in customer service, Customer Retention, Extension to customer service. Introduction to Logistics Specialists and industry stakeholders: Airlines, Shipping Lines, NVOCCs Freight Forwarders, Custom House Agents, Export Packers, 3PL & 4PL Companies, Trends, Issues, and Challenges in Logistics management, Sub-Sectors of Logistics.

Introduction to Supply Chain Management Evolution and Concept Logistics Versus Supply Chain Management Drivers of Supply Chain Logistical Drivers and Cross Functional Drivers Role of Logistics in SCM Concept of Value Chain Role of inventory in logistics Importance Types of inventory Functions of inventory Costs for holding inventory Inventory levels Need for controlling inventory Types of selective inventory control techniques Inventory planning models

Transportation Mode and Mix Documentation and Processes Rail road waterway airways and pipelines Transport mode Selection Performance Characteristics Policy Reforms and Govt Initiatives MultiModal Transportation Role of MTO Concept and definition of Inbound logistics Decision making for inbound and outbound improving inbound logistics performance A DHL Case study Strategic Sourcing Process Concept of Outbound Logistics Sameday Parts Deliveries to Automotive Service Centers

Ware house concept and Operations Types of warehouses Warehouse decisions Site selection and methods of location Design Product mix analysis Expansion Role of CWCFCI Introduction To Material Handling Techniques Introduction to material Handling and Types of MHEs Criteria for selecting MHE

Reference Books

1 Supply Chain Logistics Management, Bowersox, D. J., Closs, D. J., & Cooper, M. B. , 2013, Ohio: McGraw-Hill Education. .

2 Logistics Management, Sople, V. V. , 2012, Pearson Education..

3 Business Logistics Management, Ballou, R. H. , 2007, Pearson Education..

4 Logistics and Supply chain management. , Christopher, M., 2010, Prentice Hall.

23MRCA05 - SCULPTURE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCA05	SCULPTURE	SCP	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the significance of Sculpture art and its operations.	2	PO1
CO2	Evaluate the role of sculpture in different areas and Learn Problem-solving techniques to rectify the errors during creating new concept with sculptural point of view.	2	PO2
CO3	Analyzing the workflow in Studio by different pioneers of Art and Apply basic special Effects to the concept.	3	PO3

Syllabus

Introduction to concept visualization- Study from Geometric Principles. 1. Elements of Art: (i) Line (ii) Form (iii) Color (iv)Tone (v) Texture (v) Space 2. Principles of Composition: (i) Unity (ii) Harmony (iii) Balance (iv)Emphasis (v) Rhythm (vi)Proportion 3. Creative Process: (i) Observation (ii)Incubation (iii)Insight (iv)Evaluation (v)Elaboration. - Study of Basic Human , Bird and Animal Anatomy- in relief and 3 dimensional sculpture with detail drawings.

Purpose of Art .- for Delight, commentary, worship and Ritual, commemoration, Ritual, Commemoration, Persuasion and self-Expression. 5 Transformations- A study from Nature .- To develop and understand the sense of sculptural structure through nature

transformations in art forms and art ideas from pre historic to 21 centuary study and experimenting with those thoughts.

Reference Books

1 Digital Sculpting with Mudbox: Essential Tools and Techniques for Artists, Mike de la Flor, 28 May 2010, Routledge; .

2 Tradigital Maya: A CG Animator's Guide to Applying the Classical Principles of Animation, Lee Montgomery, 24 November 2011, Lee Montgomery .

3 Mastering Sculpture: The Figure in Clay: A Guide to Capturing the Human Form for Ceramic Artists (Mastering Ceramics), Cristina C?rdova, 14 June 2022, Quarry Books.

4 Anatomy for the Artist , Sarah Simblet, 4 August 2020, DK; Reissue edition.

23MRCL05 - COMMERCIAL CONTRACT DRAFTING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCL05	COMMERCIAL CONTRACT DRAFTING	CCD	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate a thorough understanding of the fundamental principles of commercial contract drafting.	2	PO3
CO2	Master the ability to construct clear, concise, and legally sound clauses covering critical aspects like consideration, warranties, representations, indemnification, confidentiality, breach of contract, dispute resolution, termination, and force majeure.	3	PO6
CO3	Gain the ability to analyze existing contracts, identify their strengths and weaknesses, and advise clients on their rights and obligations.	4	, PSO2

Syllabus

Foundations of Commercial Contract Drafting

Drafting Core Contract Clauses

Advanced Contract Drafting and Negotiation

Reference Books

1 Practical Guide To Drafting Commercial Contracts, Bhumesh Verma, 2023, OakBridge Publishing.

2 Drafting Corporate and Commercial Agreements- Legal Drafting Guidelines, Forms and Precedents , Rodney D Ryder, 2016, Universal Law Publishing House.

3 COMMERCIAL CONTRACTS, R. Kumar, 2024, Bharat Law House.

4 Drafting Commercial Agreements, Stuart Cakebread and Juliette Levy, 2018, Law Society.

23MRCM06 - TRANSFORM TECHNIQUES FOR ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM06	TRANSFORM TECHNIQUES FOR ENGINEERING	TTE	R	2	0	2	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Fourier transforms to solve partial differential equations and integral equations.	6	PO1, PO3, PO4
CO2	Apply Z transforms to solve Difference Equations.	6	PO1, PO3
CO3	Apply numerical methods to solve the algebraic, transcendental methods.	6	PO4
CO4	Apply numerical techniques to solve ordinary differential equations .	6	PO6

Syllabus

Solving Partial Differential Equations and Integral Equations by Fourier Transform Techniques: Introduction, Fourier Transforms, Fourier Sine Transforms, Fourier Cosine Transforms. Inverse Fourier Transforms. Apply Fourier Transform Techniques to Solve PDE and Integral Equations.

Solving Difference Equations Using Z-Transforms: Standard Z Transforms, Inverse Z Transforms, Apply Z-Transform Techniques to Solve Difference Equations. Hankel Transforms: Introduction to Hankel Transforms, Elementary Transformation, Applications of Hankel Transforms.

Solution of Algebraic and Transcendental Equations: Bisection Method, Regula-Falsi Method, Newton-Raphson Method. Iterative Methods

Taylors, Euler Method, Modified Euler Method, Runge-Kutta Method of Second Order, Runge-Kutta Method of Fourth Order.

Finite Difference, Forward, Backward, and Central Differences, Operators: Shift Operators, Average Operators, and Relations between Difference Operators. Interpolation: Lagrange and Newton\\\'s Divided Difference Formula.

Numerical Integration: Trapezoidal Rule, Simpsons rule

Reference Books

1 Numerical Methods for Scientific and Engineering Computation, B.S. Grewal, 2015, Khana Publishers.

2 Numerical Methods for Scientific and Engineering Computation, M.K. Jain, S. R. K. Iyengar and R.K. Jain, 2008, New Age International Publishers.

3 Advanced Engineering Mathematics, Erwin Kreyszing, 2020, John Wiley.

4 The Hankel Transforms, R. Piessens, 2000, CRC Press LLC.

23MRCM07 - STATISTICS WITH R PROGRAMMING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM07	STATISTICS WITH R PROGRAMMING	SWRP	R	2	0	2	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Describe the basic functions in R programming and identify the operators using in it.	3	PO1
CO2	CO 2 Doing Math and Simulation in R: Basic Math Functions, Calculating Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions For Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Vector cross Product, Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and Writing Files. STRING MANIPULATION: An Overview of String-Manipulation Functions; Regular Expressions.	3	PO1
CO3	CO 3 Probability Distributions, Normal Distribution, Poisson Distributions, Binomial Distribution, Other Distribution, Correlation and Covariance, Basic Statistics, T-Tests, ANOVA, Clustering Techniques. Creating Graphs, Graphics, The Workhorse of R Base Graphics, the plot Function, Customizing Graphs, Saving Graphs to Files.	3	PO1
CO4	CO 4 Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, Poisson Regression, other Generalized Linear Models, Survival Analysis, Nonlinear Models, Splines, Decision, Random Forests.	3	PO1
CO5	Statistical data analysis using R Programming.	3	PO1
CO6	R programming for Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, Poisson Regression, other Generalized Linear Models, Survival Analysis, Nonlinear Models, Splines, Decision, Random Forests.	3	PO1

Syllabus

Introduction, How to run R, R Sessions, and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes. Doing Math and Simulation in R, Math Function.

Extended Example Calculating Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices.

Extended Example: Vector cross Product, Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and Writer Files.

Probability Distributions, Normal Distribution, Poisson Distributions, Binomial Distribution, Other Distribution, Correlation and Covariance, Basic Statistics, T-Tests, ANOVA. Creating Graphs, Graphics,

The Workhorse of R Base Graphics, the plot Function, Customizing Graphs, Saving Graphs to Files. Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression,

Reference Books

1 Practical Data Science with R, Nina Zumel, John Mount, 3, ManningPublications.

2 Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, 3, Cambridge University Press, 2014..

3 Programming with R, Garrett, 2, Oreilly publishers.

4 Learning R for Everyone,, Lander, 3, Pearson.

23MRCM08 - MATRIX COMPUTATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRCM08	MATRIX COMPUTATION	MCT	R	2	0	2	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply sophisticated scientific computing and visualization environments to solve application problems involving matrix computation algorithms and Explain the effects of errors in computation and how such errors affect solutions.	3	PO1, PSO1
CO2	Analyse numerical algorithms, and understand the relationships between the computational effort and the accuracy of these algorithms.	3	PO2, PSO1
CO3	Apply the results produced by computer implementations of numerical algorithms.	3	PO3, PSO1
CO4	Apply Rayleigh quotient iterations and Explicit and implicit QR algorithms	3	PO3, PSO1
CO5	Apply and demonstrate the necessary analytical background for further studies leading to research in Machine Learning	3	PO4, PSO1
CO6	Apply MATLAB commands for solving problems on MatrixComputations.	3	PO4, PSO1

Syllabus

Floating point computations, IEEE floating point arithmetic, analysis of roundoff errors; Sensitivity analysis and condition numbers; Linear systems, LU decompositions, Gaussian elimination with partial pivoting.

Banded systems, positive definite systems, Cholesky decomposition - sensitivity analysis; Gram-Schmidt orthonormal process, Householder transformation, Givens rotations; QR factorization, stability of QR factorization.

Solution of linear least squares problems, normal equations, singular value decomposition(SVD), polar decomposition, Moore-Penrose inverse; Rank deficient least-squares problems; Sensitivity analysis of least-squares problems; Review of canonical forms of matrices; Sensitivity of eigenvalues and eigenvectors.

Reduction to Hessenberg and tridiagonal forms; Power, inverse power and Rayleigh quotient iterations; Explicit and implicit QR algorithms for symmetric and non-symmetric matrices; Reduction to bi-diagonal form; Golub- Kahan algorithm for computing SVD.

Reference Books

1 Fundamentals of Matrix Computations, D. S. Watkins, 2nd Ed., (2002), John Wiley.

2 Numerical Linear Algebra, L. N. Trefethen and D. Bau, 2nd Ed. (1997), SIAM.

3 Matrix Computations, G. H. Golub and C. F. Van Loan, 3rd Ed., (1996), John Hopkins University Press.

4 Applied Numerical Linear Algebra, J. W. Demmel, 1st Ed.,(1997), SIAM.

23MRDM05 - CONTENT MARKETING (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRDM05	CONTENT MARKETING	CM	M	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Applying the Behavioral Framework within a content marketing context,	3	PO3
CO2	Content Maturity Model, Six principles of content marketing, Treating content as an asset, Building audience personas, Defining the engagement cycle, Developing on-brand content, Creating brand ambassadors	3	PO1
CO3	- Analyzing current content assets, Developing different types of content, Finding good content within your organization, Creating content your audience wants	4	PO2, PO3
CO4	Marketing Content and Evaluating Impact - Content Marketing Pyramid, Brief overview analytics and tracking 10 Module 5 Ethics/Diversity in Content Marketing - Importance of considering diversity in developing and marketing content	5	PO4

Syllabus

Introduction to Content Marketing - Applying the Behavioral Framework within a content marketing context, A content marketing business model.

Defining Your Content Niche and Strategy - Content Maturity Model, Six principles of content marketing, Treating content as an asset, Building audience personas, Defining the engagement cycle, Developing on-brand content, Creating brand ambassadors, Enhanced branding through content marketing.

Developing and Distributing Content - Analyzing current content assets, Developing different types of content, Finding good content within your organization, Creating content your audience wants , Developing an 16 effective editorial calendar.

Marketing Content and Evaluating Impact - Content Marketing Pyramid, Brief overview analytics and tracking

Ethics/Diversity in Content Marketing - Importance of considering diversity in developing and marketing content, Ethical issues in the digital age.

Putting it All Together - Best practices in content marketing , Applying principles in real world case studies

Reference Books

1 Social Marketing in India, Sameer Deshpande, Philip Kotler, Nancy R. Lee, 1st Edition (2013)., tmh.

2 Content Marketing for Dummies, Susan Gunelius, 2nd Edition (2021), For Dummies.

3 A Revolutionary Approach to Inbound Sales, Content Marketing, and Today's Digital Consumer, Marcus Sheridan, Updated Edition (2019)., Wiley.

4 Made to Stick: Why Some Ideas Survive and Others Die, Chip Heath, Dan Heath, 1st Edition (2007)., Random House.

23MRFA05 - TRADING ALGORITHMNS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFA05	TRADING ALGORITHMNS	TA	M	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Explain the fundamental concepts and methodologies of algorithmic trading, including the different types of trading algorithms and their roles in financial markets.	2	PO2
CO2	Describe the process of backtesting trading strategies using historical market data, including the importance of risk management and performance evaluation.	2	PO2
CO3	Implement basic machine learning models, such as linear regression and decision trees, to develop predictive models for trading strategies using financial data.	3	PO2, PSO2
CO4	Design and implement a simple trading strategy using programming languages like Python, incorporating statistical methods such as mean reversion and momentum.	3	PO2, PSO3
CO5	Evaluate the performance of different trading algorithms by comparing their risk-adjusted returns and analyzing their behavior under various market conditions.	4	PO2, PSO3
CO6	Critically assess the limitations and challenges of applying machine learning techniques in trading, including overfitting, data snooping, and the impact of market microstructure.	4	PO2, PSO3

Syllabus

Overview of algorithmic trading, market microstructure, types of trading algorithms (execution, statistical arbitrage, market making), basics of backtesting and simulation, introduction to algorithmic trading platforms, role of latency in trading, regulatory considerations in algorithmic trading.

Statistical methods in trading (mean reversion, momentum strategies), time series analysis and forecasting, introduction to machine learning models (linear regression, support vector machines, decision trees), feature engineering for financial data, overfitting and model validation, unsupervised learning techniques (clustering, PCA), reinforcement learning basics, risk-adjusted performance metrics.

Design and implementation of trading strategies, risk management techniques in algorithmic trading, portfolio optimization methods, execution algorithms (VWAP, TWAP, implementation shortfall), slippage management, backtesting frameworks and libraries, stress testing trading strategies, optimization techniques (genetic algorithms, simulated annealing).

High-frequency trading (HFT) strategies, machine learning in high-frequency trading, blockchain and cryptocurrencies in algorithmic trading, advanced portfolio management techniques, regulatory and ethical considerations in algorithmic trading, market impact modeling, flash crashes and market anomalies, emerging trends in algorithmic trading (AI, quantum computing, decentralized finance).

Reference Books

1 Algorithmic Trading: Winning Strategies and Their Rationale, Ernie Chan, 2nd Edition (2021), Wiley.

2 Advances in Financial Machine Learning, Marcos Lopez de Prado, 1st Edition (2018), Wiley.

3 High-Frequency Trading: A Practical Guide to Algorithmic Strategies and Trading Systems, Irene Aldridge, 2nd Edition (2013), Wiley.

4 Trading and Exchanges: Market Microstructure for Practitioners, Larry Harris, 1st Edition (2003), Oxford University Press.

23MRFM05 - DIGITAL PHOTOGRAPHY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFM05	DIGITAL PHOTOGRAPHY	DPG	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding Camera Functions and Settings digital camera functions and settings, including aperture, shutter speed, ISO, white balance, and focus modes, to control exposure	1	PO1
CO2	Composition and Aesthetics: principles such as rule of thirds, leading lines, symmetry, and framing, enabling them to create visually compelling and balanced photographs.	2	PO2, PO3, PO4
CO3	Lighting Techniques: Implement various lighting techniques, both natural and artificial, to enhance the mood, texture, and depth of their photographs, understanding the effects of light direction, quality, and color.	3	PO2
CO4	Post-Processing and Editing: Editing techniques using software like Adobe Photoshop and Lightroom, enabling them to enhance and manipulate images for optimal presentation	4	PO3
CO5	Portfolio Development : Showcasing their best work, demonstrating their growth and versatility as photographers, and refine their skills and artistic vision.	5	PO4

Syllabus

History and evolution of photography Types of digital cameras and their components Basic camera settings: aperture, shutter speed, ISO, Camera Operation and Techniques

Understanding and using different camera modes (Manual, Aperture Priority, Shutter Priority, Program) Focusing techniques and depth of field Introduction to lenses and focal lengths

Rule of thirds and other composition techniques Framing and perspective Leading lines and symmetry Using color and contrast effectively. Lighting Natural vs artificial lighting

Techniques for shooting in different lighting conditions (golden hour, low light, indoors) Understanding and using flash. Introduction to post-processing software (Adobe Photoshop, Lightroom, etc.) Basic editing techniques: cropping, exposure adjustment, color correction Advanced editing techniques: retouching, filters, and special effects

Portrait photography: tips and techniques Landscape photography: capturing natural scenes Macro photography: close-up techniques Action and sports photography: capturing movement. Portfolio Development

Reference Books

1 Understanding Exposure, Bryan Peterson, 2016, Amphoto Books.

2 Digital Photography Complete Course, David Taylor, 2019, Amphoto Books.

3 Mastering Digital Photography, David D. Busch, 2008, Course Technology PTR.

4 The Adobe Photoshop Lightroom Classic CC Book for Digital Photographers, Scott Kelby, 2019, New Riders.

23MRFT05 - FOOD PACKAGING TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRFT05	FOOD PACKAGING TECHNOLOGY	FPT	R	2	0	2	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand designing and development of safe food packaging material.	2	PO7
CO2	Apply packaging requirement for food products and different types of food packaging systems.	3	PO7
CO3	Apply various packaging materials and equipment used in packaging industry.	3	PO7
CO4	Apply suitable packaging for a given food product.	3	PO7
CO5	Apply the learning toward establishing marketable food products.	3	PO7
CO6	Apply advanced packaging to select foods.	3	PO7

Syllabus

Outline of Food packaging: Need, Role of packaging in extending shelf life of foods, designing packaging materials, testing of packaging materials, package performance tests, Principles of developing safe and protective packing, Safety assessment of food packaging materials.

Food packaging systems: Product characteristics and package requirements, Introduction of food packaging system, Different forms of packaging, Rigid, semi-rigid, flexible forms of packaging, Different packaging system for-Dehydrated foods, Frozen foods, Dairy products, Fresh fruits, Vegetables, Meat, Poultry, Sea foods.

Packaging materials. Types, characteristics, uses. Paper (Pulping, Fibrillation, Beating, Types of papers, testing methods). Glass (Composition, Properties, Types, Methods of bottle making). Metals (Tinplate, Types of cans, Aluminum containers, Lacquers). Plastics (Types, films, laminated and co-extruded plastic materials).

Package accessories and advances in Packaging technology: Introduction, Active packaging, MAP, Aseptic packaging, Packages for convenience, Biodegradable plastics, Coatings. Packaging equipment and machinery (Vacuum packaging, CA & MA packaging, Sealing, shrink packaging, FFS, Aseptic packaging, Retort, Bottling, Carton making, Printing).

Packaging technology to preserve perishable foods. Select perishable foods. Identify their preservation requirements to achieve a longer shelf-life. Design a suitable packaging for the select foods by conducting the necessary testing.

Application of advanced packaging systems for shelf-life extension of foods.

Reference Books

1 A Handbook of Food Packaging, P. John Jacob, 2010, Daya Publishing House.

2 Handbook of Food Packaging Technology, EIRI Board, 2015, EIRI.

3 Fundamentals of Packaging Technology, Walter Soroka, 2009, IOPP.

4 FOOD PACKAGING: PRINCIPLES AND PRACTICE, ROBERTSON L. GORDON, 2016, CRC Press.

23MRGD05 - PUBLICATION DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRGD05	PUBLICATION DESIGN	PUDG	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Mastery of basic design principles such as balance, contrast, alignment, repetition, proximity, and white space.	2	PO1
CO2	Skills in editing and enhancing images to be used in publications. Ability to integrate images effectively with text and other design elements.	2	PO2
CO3	Apply typography, color theory, and grid systems effectively.	3	PO3

Syllabus

Design Principles and Elements Layout and composition Introduction to grid systems Importance of white space , Typography Basics of typography Font selection and pairing Hierarchy and readability,Color Theory Basics of color theory Creating a color palette Using color to convey messages, Working with Images and Graphics Image selection and quality Integrating images into layouts Creating and using graphics, Tools and Software Introduction to Adobe InDesign Overview of Photoshop and Illustrator for publication design Basic tools and functions, Print Publications Designing for print specification.

Designing for digital media Interactive elements (links, multimedia) Responsive design principles , Cover Design Principles of effective cover design Creating engaging and informative covers Case studies and examples ,Advanced Layout Techniques

Production Processes Pre-press and printing techniques Digital publication optimization Guest lecture from industry professional, Project Management in Publication Design Planning and executing design projects Working with clients and teams Hands-on exercise: Developing a project plan for a publication ,Critical Analysis and Feedback Analyzing publication designs Providing and receiving constructive feedback Hands-on exercise: Peer review session ,Portfolio Development Assembling a professional portfolio Presenting and discussing design work Hands-on exercise: Portfolio review and critique , Final Project Presentation Final project completion

Reference Books

1. Making and Breaking the Grid, Second Edition, Updated and Expanded: A Graphic Design L, Timothy Samara, January 17, 2015, Rockport Publishers.
2. Thinking with Type: A Critical Guide for Designers, Writers, Editors, & Students, Ellen Lupton, 2nd edition, 6 October 2010, Princeton Architectura.
3. The Elements of Typographic Style, Robert Bringhurst , 2nd edition ,30 September 1996, Hartley & Marks Inc.
4. Designing Books: Practice and Theory, Jost Hochuli and Robin Kinross, April 1, 2004, Hyphen Press .

23MRIB05 - PROFESSIONAL SKILLS FOR INTERNATIONAL BUSINESS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIB05	PROFESSIONAL SKILLS FOR INTERNATIONAL BUSINESS	PIB	M	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the importance of cultural awareness in international business	2	PO6
CO2	Understand the role of protocol in fostering business relationships.	2	PO3
CO3	Apply the impact of economic policies on international business.	3	PO9
CO4	Interpret the effective marketing strategies for international markets.	3	PO9

Syllabus

Cross-Cultural Communication and Negotiation-Introduction to Cross-Cultural Communication,Cultural Dimensions and Models,Effective Communication Strategies,Cross-Cultural Negotiation,

International Business Etiquette and Protocol-Introduction to Business Etiquette,Meeting and Greeting Protocols,Business Dress and Attire,Dining Etiquette and Social Norms,Gift giving and receiving

International Trade and Economics-Introduction to International Trade,Trade Theories and Models,Trade Policies and Agreements,International Economic Institutions

International Marketing Strategies-Introduction to International Marketing,Market Research and Analysis,Market Entry Strategies,Global Branding and Positioning

Reference Books

1 International Business: Competing in the Global Marketplace, Charles W. L. Hill, 11th edition, 2017, McGraw-Hill Education.

2 Global Business Today, Charles W. L. Hill and G. Tomas M. Hult, 10th edition, 2017, McGraw-Hill Education.

3 International Business: The Challenges of Globalization, John J. Wild and Kenneth L. Wild, 9th edition, 2019, Pearson.

4 Cross-Cultural Management: Essential Concepts, David C. Thomas and Mark F. Peterson, 4th edition, 2016, Sage Publications.

23MRID05 - DESIGN PRESENTATION AND COMMUNICATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRID05	DESIGN PRESENTATION AND COMMUNICATION	DPC	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand and explain the fundamental concepts of design presentation and communication in interior design and recognizing the importance of effective communication in conveying design ideas, describing various methods of design presentation such as sketches, renderings, mood boards, and 3D models	2	PO2
CO2	Understanding the target audience and tailoring communication accordingly, the significance of clear and concise messaging, and the utilization of visual elements such as color, typography, and imagery to enhance communication	2	PO4
CO3	Understand the tools and techniques essential for effective design presentation in interior designs including an overview of various tools and software such as Adobe Creative Suite, SketchUp, and AutoCAD, and a step-by-step guide to creating different types of design presentations like mood boards, concept sketches, digital renderings, and virtual walkthroughs.	2	PO4
CO4	Applying and demonstrating strategies for effective client interaction and collaboration in the design process. This includes understanding the importance of collaboration and client feedback, employing strategies to communicate design concepts to clients with varying levels of design knowledge, building rapport and establishing trust through clear communication, and managing client expectations and concerns.	3	, PSO3
CO5	Applying and demonstrating the principles and strategies for presenting sustainable design solutions in interior design. This includes understanding sustainable design principles and their importance, integrating sustainable design solutions into presentations, effectively communicating the environmental and social benefits of sustainable design to clients, and analyzing case studies of projects that prioritize sustainability.	3	PO9

Syllabus

Co1: Understanding Design Presentation. Introduction to design presentation in interior design. Importance of effective communication in conveying design ideas. Overview of different methods of design presentation: sketches, renderings, mood boards, 3D models, etc. Exploring the role of technology in modern design presentations. Case studies showcasing successful design presentations and their impact on projects.

Co2: Elements of Effective Communication. Exploring the principles of effective communication in interior design. Understanding the target audience and tailoring communication accordingly. Importance of clear and concise messaging in design presentations. Utilizing visual elements, such as color, typography, and imagery, to enhance communication. Strategies for conveying design concepts and ideas with clarity and persuasion.

Co3: Tools and Techniques for Design Presentation. Overview of various tools and software used in design presentation, such as Adobe Creative Suite, SketchUp, AutoCAD, etc. Step-by-step guide to creating different types of design presentations, including mood boards, concept sketches, digital renderings, and virtual walkthroughs. Tips for selecting the most appropriate presentation method based on project requirements and client preferences. Incorporating storytelling techniques to engage and captivate the audience. Best practices for organizing and structuring design presentations for maximum impact.

Co4: Client Interaction and Collaboration. Importance of collaboration and client feedback in the design process. Strategies for effectively communicating design concepts to clients with varying levels of design knowledge. Building rapport and establishing trust with clients through clear and transparent communication. Techniques for managing client expectations and addressing concerns during the design presentation. Case studies illustrating successful client collaboration and its impact on project outcomes.

Co5: Presenting Sustainable Design Solutions. Overview of sustainable design principles and their importance in modern interior design. Strategies for integrating sustainable design solutions into design presentations. Communicating the environmental and social benefits of sustainable design to clients. Showcasing case studies of projects that prioritize sustainability in their design presentations. Exploring future trends in sustainable interior design and their implications for design communication. Each chapter should delve into the intricacies of design presentation and communication within the context of interior design, providing both theoretical frameworks and practical guidance for professionals in the field

Reference Books

1 Presentation Zen Design: A simple approach tp presenting in today's world, Garr Reynols, 1st, 2014, New Riders.

2 Presentation Zen Design: Simple Design Principles and Techniques to Enhance Your Presentations, Garr Reynolds, 1st,2009, New riders.

3 Presentation Zen: Simple Ideas on Presentation Design and Delivery, Garr Reynols, 1st, 2008, New Riders.

4 Interior Design Visual Presentation: A Guide to Graphics, Models & Presentation Techniques, Maureen Mitton, 2nd, 2004, Wiley, 2004.

23MRIM05 - PROJECT INNOVATE: STRATEGIES FOR ENTREPRENEURIAL GROWTH (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIM05	PROJECT INNOVATE: STRATEGIES FOR ENTREPRENEURIAL GROWTH	PISEG	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	to analyze market opportunities for entrepreneurial growth.	4	PO2, PO9, PSO2
CO2	to develop strategic plans and innovative approaches for entrepreneurial ventures.	6	PO2, PO9, PSO2
CO3	to implement scaling strategies and sustainability practices for long-term entrepreneurial success.	3	PO2, PO9, PSO2

Syllabus

Foundations of Entrepreneurial Growth: the introduction to entrepreneurship, characteristics of successful entrepreneurs, identifying opportunities for growth, market research and analysis, developing a growth mindset, and case studies of entrepreneurial success.

Strategic Planning and Innovation: strategic planning for startups, business model innovation, product development and innovation, lean startup methodology, design thinking for entrepreneurs, and competitive analysis and strategy.

Scaling and Sustaining Growth : scaling strategies for entrepreneurial ventures, financial planning and management, building and leading high-performance teams, leveraging technology for growth, navigating legal and regulatory challenges, and long-term sustainability and impact.

Reference Books

1 The Lean Startup, Eric Ries, 1st (2011), Crown Business.

2 The Four Steps to the Epiphany, Steve Blank, 2nd (2020), K&S Ranch.

3 Business Model Generation, Alexander Osterwalder, Yves Pigneur, 1st (2020), Wiley.

4 Blue Ocean Strategy, W. Chan Kim, Ren?e Mauborgne, 1st (2018), Harvard Business Review Press.

23MRIP05 - LAW OF DESIGNS, GEOGRAPHICAL INDICATIONS AND PLANT VARIETIES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRIP05	LAW OF DESIGNS, GEOGRAPHICAL INDICATIONS AND PLANT VARIETIES	LODGP	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic principles relating to the Intellectual Property Rights and Design Law.	2	
CO2	Understand the emerging dimensions of IPR	2	
CO3	Understand the Farmers and bio diversity related IP Rights.	2	
CO4	Understand the Bio-Technology Law & IP Rights	2	

Syllabus

Definition & Conception of Industrial Designs under Design Act, 2000, Definition and Conception of Trade marks,

Salient Features of Geographical Indications of Good Act, 2000, Geographical Indication & Protection of Traditional knowledge

Notion & Concept of Farmer & Breeder Right under Protection of Plant Variety Act, 2001, Conservation Bio-diversity & Diversity Related IP Rights, Laws & Flaws Relating to Conservation of Biological Diversity.

Notion and concept of bio technology law, Nexus Between Bio-Technology and Law, bio ethics and related IP Rights.

Reference Books

1 Law Relating to Intellectual Property Rights, V.K.Ahuja, 2nd, Lexis Nexis.

2 Intellectual Property Rights, Elizabeth Verkey, 4th, Eastern Book Company.

3 Law of Trademark, Copyrights, Patents and Designs, Roy Chowdhary, 5th, Kamal Law house.

4 Intellectual Patent Rights, P.Narayanan, 6th, Eastern Law House.

23MRMI05 - BUSINESS INTELLIGENCE & DATA ANALYTICS PROJECT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRMI05	BUSINESS INTELLIGENCE & DATA ANALYTICS PROJECT	BIDA	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply statistical and exploratory data analysis techniques to identify patterns and trends.	3	PO1, PO3, PO4, PSO1
CO2	CO2 Analyze and interpret visual representations of data.	4	PO2, PO3, PO4, PSO1
CO3	Create interactive dashboards and reports to present insights effectively	5	PO1, PO2, PO3, PSO1

Syllabus

Introduction to Business Intelligence and Data Analytics, Overview of business intelligence and data analytics concepts, Importance of data-driven decision making, Ethical considerations in data analytics projects, Data Collection and Preprocessing, Data collection techniques and data sources. Data cleaning, integration, and transformation, Handling missing data and outliers

Business Intelligence Tools and Visualization, Overview of popular business intelligence tools (e.g., Tableau, Power BI), Creating interactive dashboards and reports, Design principles for effective data visualization, Communication and Presentation of Insights, Effective communication strategies for data-driven insights, Storytelling with data: creating compelling narratives, Presenting findings to different stakeholders

Exploratory Data Analysis (EDA), Descriptive statistics and data visualization techniques, Identifying patterns, trends, and relationships in data, Data profiling and data quality assessment, Predictive Modelling and Data Mining. Introduction to predictive modelling and data mining concepts, Regression analysis and time series forecasting, Classification, and clustering algorithms

Reference Books

1 Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, Foster Provost and Tom Fawcett, 2013, O'Reilly .

2 Business Intelligence Guidebook: From Data Integration to Analytics, Rick Sherman, 2014, Morgan Kaufmann.

3 Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software, Daniel G. Murray, 2016, Wiley.

4 The Big Data-Driven Business: How to Use Big Data to Win Customers, Beat Competitors, and Boost Profits, Russell Glass and Sean Callahan, 2014, Wiley.

23MROB05 - TEAM BUIDLING AND COLLABORATION SKILLS FOR MANAGERS (M)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MROB05	TEAM BUIDLING AND COLLABORATION SKILLS FOR MANAGERS	TBCM	M	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the importance of team building and collabration in an organization	2	PO1
CO2	Apply communication and feedback in teams for better collabration	3	PO6
CO3	Identify different types of conflict resolution in teams	3	PO9
CO4	Identify the importance of concept of motivation and to describe different motivational theories	3	PO9

Syllabus

Introduction to Team Building and Collaboration-Importance of Team Building and Collaboration, Key Principles of Effective Team Building and Collaboration, Strategies for Promoting Collaboration within Team

Understanding Team Roles and Responsibilities- Team Charter, Team Roles and Responsibilities, Communication and Feedback in Teams.

Conflict Resolution in Teams-Types of Conflict, Conflict Resolution Strategies, Building a Positive Team Culture

Motivational Theories-Maslow\'s Hierarchy of Needs, Herzberg\'s Two-Factor Theory, Expectancy Theory, Equity Theory, Goal-Setting Theory, Social Learning Theory

Reference Books

1 Reimagine Teams: The Missing Piece in Team Building to Achieve Breakthrough Results, Mark Samuel , 1st edition, 2021, USA Today.

2 TeamWork: How to Build a High-Performance Team, Natlie Dawson, 1st edition, 2021, Houndstooth Press .

3 LEADERSHIP AND TEAM BUILDING, Uday Kumar Haldar, 1st edition, 2010, Oxford University Press.

4 Team Building for Diverse Work Groups: A Practical Guide to Gaining and Sustaining Performance in Diverse Teams , Selma G. Myers, 4th edition, 1996, Oxford University Press.

23MRPA05 - MODERN FARMING TECHNIQUES AND INNOVATIONS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPA05	MODERN FARMING TECHNIQUES AND INNOVATIONS	AELP	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the impact of technological innovations on agricultural productivity.	3	PO3, PO4
CO2	Analyze about sustainable and environmentally friendly farming practices.	4	PO3, PO4
CO3	Analyze and develop practical skills in using advanced farming technologies.	4	PO3, PO4

Syllabus

Modern farming and sustainable agriculture practices aim to enhance food production efficiency while minimizing environmental impact, promoting soil health, conserving water, reducing chemical inputs, and ensuring economic viability for farmers. These practices incorporate advanced technologies, organic farming, crop rotation, integrated pest management, and agroecological principles to create resilient agricultural systems that support long-term food security and ecosystem health.

Sterile Techniques: Essential for preventing contamination by microorganisms. Includes autoclaving equipment and media, using laminar flow hoods, and employing aseptic techniques during handling. Synthetic and Natural Media Components: Media provides essential nutrients for plant growth in vitro. Synthetic media: Typically includes inorganic salts, vitamins, amino acids, and carbon sources like sucrose. Natural media: May include coconut milk, potato extract, or banana puree to supplement nutrients. Growth Regulators: Critical for directing plant growth and development in vitro. Auxins (e.g., IAA, NAA): Promote root formation. Cytokinins (e.g., BAP, Kinetin): Promote shoot formation. Gibberellins: Stimulate stem elongation, seed germination. Abscisic acid: Induces dormancy, stress responses.

Greenhouse Technology and Management: Structure: Greenhouses are enclosed structures with transparent materials like glass or plastic to trap solar energy. Climate Control: Includes heating, cooling, ventilation, and humidity control to create optimal growing conditions. Irrigation Systems: Drip irrigation, misting, and automated watering systems ensure consistent moisture levels. Lighting: Supplemental lighting (LEDs, HPS) extends growing seasons and enhances plant growth. Pest and Disease Management: Integrated Pest Management (IPM) and biological controls are used to minimize pesticide use. Vertical Farming Systems: Structure: Multi-layered, vertically stacked growing systems often housed in urban settings or unused industrial spaces. Lighting: Uses artificial lighting (LEDs) to provide uniform light distribution. Hydroponics and Aeroponics: Soil-less growing techniques using nutrient-rich solutions. Automation: Advanced technologies for climate control, nutrient delivery, and monitoring systems.Hydroponics and Aquaponics: Hydroponics: System: Plants are grown in a nutrient-rich water solution. Media: May use inert media like perlite, rock wool, or coco coir for plant support. Benefits: Efficient water and nutrient use, faster plant growth, and higher yields.

Reference Books

1 Precision Agriculture Technology for Crop Farming, Qin Zhang, 1(2015), CRC Press.

2 The New Harvest: Agricultural Innovation in Africa, Calestous Juma, 1(2019), Oxford Academic.

3 Sustainable Agriculture and Food Systems, Stephen R. GliessmanStephen R. GliessmanStephen R. Gliessman, 3(2015), CRC Press.

4 Plant Tissue Culture : Techniques and Experiments., Smith, R.H, 3(2012), Academic Press, San Diego, CA, USA..

23MRPY05 - PRACTICAL PHARMACOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRPY05	PRACTICAL PHARMACOLOGY	PRI	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analysis of pharmacological agents in solutions and biological fluids using analytical tools	3	PO3, PSO3
CO2	Apply knowledge on Handling of laboratory animals routes of drug administrationTechniques of blood sampling, anesthesia and euthanasia of experimental animals. Functional observation battery tests (modified Irwin test)	4	PO3, PSO3
CO3	Apply knowlwdge to understand the MOA of CNS Pharmacological agents and others	4	PO3, PSO3
CO4	Apply knowledge and experiment to understand DNA and RNA isolated from organisms and analysis of the same by diagnostic tests	4	PO3, PSO3
CO5	Apply knowledge to test agents for the toxicity including genotoxicity	4	PO3, PSO3
CO6	Apply knowledge to extract biological fluids to determine the drug concentrations in it by analytical techniques	4	PO3, PSO3

Syllabus

Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer Simultaneous estimation of multi component containing formulations by UV spectrophotometry Experiments based on HPLC Experiments based on Gas Chromatography Estimation of riboflavin/quinine sulphate by fluorimetry Estimation of sodium/potassium by flame photometry

Handling of laboratory animals. Various routes of drug administration. Techniques of blood sampling, anesthesia and euthanasia of experimental animals. Functional observation battery tests (modified Irwin test)

Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsant activity. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity. Evaluation of diuretic activity. Evaluation of antiulcer activity by pylorus ligation method. Oral glucose tolerance test.

Isolation and identification of DNA from various sources Bacteria, Cauliflower, onion, Goat liver. Isolation of RNA from yeast Estimation of proteins by Braford Lowry in biological samples. Estimation of RNA and DNA by UV Spectroscopy Gene amplification by PCR.

Protein quantification Western Blotting. Enzyme based in vitro assays MPO, AChEs, alpha amylase, alpha glucosidase. Cell viability assays MTT Trypan blue SRB. DNA fragmentation assay by agarose gel electrophoresis. DNA damage study by Comet assay.

Apoptosis determination by fluorescent imaging studies. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using softwares Enzyme inhibition and induction activity Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques

Reference Books

1 Animal Cell Culture: A Practical Approach, John R. Masters, 3rd (2000), Oxford University Press.

2 Practical Manual of Experimental and Clinical Pharmacology, Bikash Medhi, Ajay Prakash, 2nd (2016), Jaypee Brothers Medical Publishers Pvt. Ltd..

3 Spectrometric Identification of Organic Compounds, Robert M. Silverstein, Francis X. Webster, David J. Kiemle, David L. Bryce, 8th (2014), Wiley.

4 Drug Discovery and Evaluation: Pharmacological Assays, Hans G. Vogel, J?rgen Maas, Franz J. Hock, Dieter Mayer, 4th (2015), Springer.

5 Fundamentals of Experimental Pharmacology, M.N. Ghosh, 6th (2015), Hilton & Company.

23MRTP05 - TECH INNOVATION PROJECT FOR ENTREPRENEURS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23MRTP05	TECH INNOVATION PROJECT FOR ENTREPRENEURS	TIPFE	R	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	to develop innovative tech project ideas by identifying opportunities, conducting market research, and creating detailed project proposals.	3	PO2, PO6, PSO2
CO2	to create and iteratively improve prototypes using appropriate techniques and methodologies, incorporating user feedback and Agile practices to refine their Minimum Viable Product (MVP).	6	PO2, PO6, PSO2
CO3	to implement a comprehensive business plan and go-to-market strategy, effectively pitch their projects to potential investors, and navigate the challenges of scaling and launching their tech innovations.	3	PO2, PO6, PSO2

Syllabus

Identifying and Evaluating Tech Opportunities, Techniques for Idea Generation and Brainstorming, Customer Discovery and Market Research, Developing and Refining Concepts, Creating Detailed Customer Personas, Formulating Value Propositions, Project Proposal Development

Prototyping Techniques and Tools, Physical and Digital Prototypes, User Testing and Feedback, Iterative Development and Continuous Improvement, Minimum Viable Product (MVP) Development, Agile and Lean Methodologies, User-Centered Design

Creating a Comprehensive Business Plan, Market Analysis and Competitive Positioning, Developing a Go-to-Market Strategy, Funding and Investment Strategies, Pitching to Potential Investors, Scaling and Managing Growth, Navigating Legal and Regulatory Challenges, Final Presentation and Pitching

Reference Books

1 Zero to One, Peter Thiel, Blake Masters, 1st (2019), Crown Business.

2 The Startup Owner's Manual, The Startup Owner's Manual Steve Blank, Bob Dorf, 1st (2012), K&S Ranch.

3 The Innovator's Dilemma, Clayton M. Christensen, 1st (2013), Harvard Business Review Press.

4 Innovation Management, Keith Goffin, Rick Mitchell, 1st (2016), Palgrave Macmillan.

23SDAD01A - DATA ANALYTICS AND VISUALIZATION (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDAD01A	DATA ANALYTICS AND VISUALIZATION	DAV	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the basic concepts of Data Science and its application.	3	PO1, PO3, PSO1, PSO2, PSO3
CO2	Apply various statistical tools for testing hypothesis.	3	PO1, PO2, PO3, PSO1, PSO2, PSO3
CO3	Apply Python concepts like Numpy and pandas to hanle data.	3	PO2, PO3, PSO1, PSO2
CO4	Apply visualization techniques for graphical representation of data	3	PO2, PO3, PSO1, PSO2
CO5	Apply advanced Visualization techniques	3	PO2, PO3, PSO1, PSO2
CO6	Analyzing Data through Python Visualization Techniques	4	PO2, PO3, PSO1, PSO2
CO7	Analyzing data through visualization Tool Tableau	4	PO2, PO3, PSO1, PSO2

Syllabus

Introduction AI, Machine Learning and Data Science, What is data Science Extracting Meaningful patterns, Building representative models, Combination of Statistics, Machine Learning and Computing, Learning Algorithms, Associated fields, Data Science Classification, Data objects and Attribute Types, Measuring Data similarity and dissimilarity Data Collection and Data PreProcessing overview Data Cleaning Data Integration and Transformation Data Reduction Data Discretization

Descriptive Statistics Sampling Techniques Data Classification Measures of Central Tendency Measures of Variation Quartiles and Percentiles Moments Skewness and Kurtosis Exploratory Data Analytics Descriptive Statistics Mean, Mode, and Standard Deviation Box Plots Pivot Table Heat Map Correlation Statistics ANOVA

Data Wrangling with NumPy and Pandas Python list vs NumPy arrays Whats the Difference Creating a NumPy Array, Shape and Reshaping of NumPy Array, Indexing and Slicing of NumPy Array, Stacking and Concatenating NumPy Arrays, Broadcasting in NumPy Arrays, Time series, Sorting in NumPy Arrays, Pandas Series, Data Frame, indexing, sorting, loading data from CSV, Aggregation, concatenation, group by

Visualization and simple metrices Data Analytics Communication, Data Types for Plotting Data Types and Plotting, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density

Customizing Plot Legends, Customizing Colour bars, Multiple Subplots, Text and Annotation, Customizing Ticks

Reference Books

1 The Data Science Handbook, Field Cady, 1, Wiley Book.

2 Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython, Wes Mc Kinney, 2, O Reilly.

3 Statistical inference for data science, Brian Caffo, 1, Global Edition Leanpub.

4 Global Edition Leanpub, Alexander Loth , Nate Vogel, Sophie Sparkes, 1, Wiley.

23SDBT01A - MEDICAL LAB TECHNOLOGY (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDBT01A	MEDICAL LAB TECHNOLOGY	MLT	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply haematology techniques to estimate various cells in blood	3	PO1, PO3
CO2	Apply various biological fluids using clinical biochemistry techniques	3	PO4, PO6
CO3	Apply the roles of biomolecues in biological fluids	3	PO3, PO4
CO4	Apply the role of biomarkers in clinical studies	3	PO1, PO6

Syllabus

Separation of plasma and serum, Blood smear preparation, TRBC test, TWBC test, Hb estimation, Blood typing, Bleed and clot time, ESR estimation

Typhoid test and VDRL test, Glucose detection in fluids, Collection of blood, Coagulation tests, Separation of serum and plasma from various Animal blood samples, Preparation of blood smear and staining by Giemsa, Total count of RBC by neubaur chamber method, Total count of WBC by neubaur chamber method

Estimation of Hemoglobin by Sahali method, Determination of ABO blood grouping, Determination of Blood bleeding and clotting time, Estimation of ESR by Westergren method, Widal Tests, VDRL tests, Estimation of glucose levels in blood sample, Blood sample collection and preservation, Coagulation tests

Blood culturing on microbial media, Drug screening, Saliva culturing on microbial media, Nasal swab culturing on microbial media, Dental culturing on microbial media, Lectin agglutination tests, Hormone testing, Blood cross matching

Reference Books

1. Introduction, Haematology and Coagulation, Immunohaematology Vol-1, Kanai, L Mukherjee and Swarajit Ghosh, 2010, Mc Graw Hill Publication.
2. Laboratory Manual of Clinical Pathology and Hematology, Santosh Kumar Mondal , 2022, CBS Publishers & Distributors Pvt. Ltd.
3. Essentials of Clinical Pathology, Shirish M Kawthalkar , 2010, JAYPEE BROTHERS MEDICAL PUBLISHERS.
4. Concise Book of Medical Laboratory Technology (Methods and Interpretations), Ramnik Sood, 2015, Jaypee Brothers Medical Publishers.
5. Chinmay's Competition Guide for D.M.L.T. (Diploma in Medical Laboratory Technology), Various Authors , 2021, Jain Publications, Jaipur (Rajasthan).

23SDBT05A - COMPUTER AIDED DRUG DESIGN (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDBT05A	COMPUTER AIDED DRUG DESIGN	CADD	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the knowledge of drug discovery methods, including techniques such as high-throughput screening, lead optimization, and pharmacophore modeling.	3	
CO2	Illustrate protein function through structural prediction through computer-based modeling. Understand methods for predicting protein folding, identifying structural motifs, and determining active sites	3	
CO3	Apply the knowledge of biomolecular interactions to study the interactions between proteins, nucleic acids, and other biomolecules. Understand the significance of these interactions in biological processes	3	
CO4	Demonstrate methods of computational drug design in small molecule analysis. Utilize techniques such as molecular docking, virtual screening, and quantitative structure-activity relationship (QSAR) modeling	3	

Syllabus

Practical Introduction to Molecular Modeling and Drug Design: Drug-Definition, history and types; Overview of drug discovery and development. Introduction to Drug Design, Pharmacokinetics and Pharmacodynamics, Modern Drug Discovery Technologies, Drug Development Phases, Case Studies in Drug Discovery. Case Studies in Drug Discovery: Analysis of successful drug discovery stories to understand practical applications and challenges in the field.

Prediction and Structural Analysis of Macromolecules: Macromolecular structure databases - Protein Data Bank, structural classification of protein. Advanced Structural Analysis Techniques, Protein Function Prediction, Comparative Protein Modeling, Structural Bioinformatics Tools, Structural Databases Beyond PDB. Structural Databases Beyond PDB: Exploring alternative databases like SCOP, CATH, and InterPro for protein structure information.

Biomolecular Interactions and Drug Discovery Methods: Small Molecule Analysis - Structural analysis, Physico-Chemical analysis, prediction of ADMET properties and biological activity. Ligand-Based Drug Design, Structure-Based Drug Design, Advanced ADMET Modeling, Biological Activity Assays, High-Throughput Screening Technologies. Introduction to methods for evaluating large libraries of compounds for potential drug candidates.

Molecular Modeling: Drug Target Prediction - Methods and Applications; Introduction to Biological Networks, GRN, Metabolic Networks, and Gene Ontology Analysis. Target Identification and Validation, Biological Network Analysis, Gene Regulatory Networks (GRN), Metabolic Pathway Analysis, Gene Ontology (GO) Analysis. Methods for classifying and analyzing gene functions and relationships.

Reference Books

1. Molecular Modeling: Basic Principles and Applications. , Hans-Dieter H, Wolfgang Sippl, Didier Rognan, Gerd Folkers. , 2017, John Wiley & Sons .
2. Molecular Modeling of Proteins. , Andreas Kukol, 2018, Springer New York.
3. Molecular Modelling Principles and Applications., Pual Clinton, 2017, Pearson Publication.
4. Computational Drug Design., D. C. Young. , 2011, John Wiley & Sons .
5. Molecular Modeling and Drug Design: Principles and Applications, Anand Solomon, 2016, Narosa Publishing House.

23SDCE01A - VISUALIZATION AND MODELLING FOR STRUCTURAL DESIGN (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDCE01A	VISUALIZATION AND MODELLING FOR STRUCTURAL DESIGN	VMSD	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding Visualization Techniques: Explore various visualization methods and techniques used in structural design, including 2D drawings, 3D models, renderings, animations, and virtual reality.	3	PO1, PO5, PSO1
CO2	Introduction to Structural Modelling Software: Gain proficiency in using industry-standard structural modelling software such as Autodesk Revit, Tekla Structures, and SAP2000 for structural analysis and design.	3	PO1, PO5, PSO1
CO3	Parametric Modelling: Learn the principles of parametric modelling and its application in generating complex geometries, optimizing structural systems, and facilitating design iterations.	3	PO1, PO5, PSO1
CO4	Visualization Tools and Techniques: Explore advanced visualization tools and techniques, including photorealistic rendering, lighting effects, and material properties to enhance the visual representation of structural designs.	3	PO1, PO5, PSO1
CO5	Integration with BIM: Understand the principles of Building Information Modeling (BIM) and its integration with structural design software for collaborative design, clash detection, and construction planning.	3	PO1, PO5, PSO1
CO6	Structural Analysis and Simulation: Learn how to perform structural analysis and simulation using modelling software to evaluate the behavior and performance of structural systems under various loading conditions.	3	PO1, PO5, PSO1
CO7	Implement collaborative design processes using integrated modeling tools.	3	PO1, PO5, PSO1

Syllabus

Introduction to Visualization and Modelling Overview of visualization techniques Introduction to structural modelling software Importance of visualization in structural design

Basics of Structural Modelling Software Interface overview and navigation Creating basic structural elements: beams, columns, slabs Modifying geometry and properties

2D Drafting and Detailing Techniques Creating 2D drawings and plans Dimensioning and annotation Detailing structural components

Introduction to 3D Modelling and Parametric Design Transitioning to 3D modelling Introduction to parametric modelling concepts Creating parametric families and components

Advanced Visualization Techniques Materials and textures Lighting and rendering settings Introduction to photorealistic rendering

Structural Analysis and Simulation Basics of structural analysis Performing structural analysis within modelling software Interpreting analysis results

Reference Books

1 Visualization and Modelling for Structural Design, Dr. Sarah Lee, Dr. Mark Thompson, 1st Edition, Wiley.

2 Visualization Analysis and Design, Tamara Munzner, 1st Edition, CRC Press, Taylor & Francis Group.

3 Visualization, Modeling, and Graphics for Engineering Design, Dennis K. Lieu and Sheryl A. Sorby, 2nd Edition, Cengage Learning.

4 Structural Analysis: Principles, Methods and Modelling, Raymond Ian Gilbert and Gianluca Ranzi, 1st Edition, CRC Press.

23SDCE02A - BUILDING INFORMATION MODELLING (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDCE02A	BUILDING INFORMATION MODELLING	BIM	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understand Building Information Modeling (BIM) software to create and manipulate 3D digital representations of construction projects	2	PO1, PO5, PO6, PSO1
CO2	Impact of BIM on design, construction, and facility management to optimize outcomes	3	PO1, PO5, PO6, PSO1
CO3	Integrate data from diverse sources into BIM models for comprehensive analysis and decision-making	4	PO1, PO5, PO6, PSO1
CO4	Demonstrating comprehension and practical application of Building Information Modeling(BIM)	2	PO1, PO5, PO6, PSO1
CO5	Create and manage BIM-based documentation, including drawings, schedules, and cost estimates.	3	PO1, PO5, PO6, PSO1

Syllabus

Introduction to Building Information Modeling (BIM): overview of BIM principles and concepts, History and evolution of BIM in the construction industry Benefits and advantages of implementing BIM in construction projects, BIM software and tools overview, Introduction to BIM project workflows and collaboration processes

BIM Modeling and Visualization: Fundamentals of BIM modeling techniques, Creating and managing 3D digital models using BIM software, Visualization and rendering techniques for BIM models Applying BIM for design exploration and iteration, Clash detection and coordination using BIM models

BIM Data Management and Integration: BIM data management strategies and best practices in BIM projects, Integrating data from various sources and disciplines into BIM models, Parametric modeling and family creation in BIM, Linking BIM models with external databases and spreadsheets, BIM interoperability and data exchange standards

BIM in Project Lifecycle Phases: BIM in the design phase: Conceptual design, detailed design, and design coordination, BIM in the construction phase: Construction sequencing, quantity takeoff, and scheduling, BIM in the facility management phase: Asset management, maintenance planning, and energy analysis Collaborative workflows and information exchange during project lifecycle phases, BIM for project coordination and communication with stakeholders

Advanced Topics in BIM: Advanced clash detection and resolution techniques, BIM for sustainable design and green building practices, BIM for facilities management and operations, BIM for infrastructure and civil engineering projects, Emerging trends and future developments in BIM

Reference Books

1 Building Information Modeling, Karen M. Kensek, Douglas Noble,, 2014, Routledge.

2 BIM Handbook: A Guide to Building, Chuck Eastman, Paul Teicholz, 2018, Wiley.

3 BIM and Construction Management, Brad Hardin, Dave McCool, and Chuck, 2015, John Wiley & Sons.

4 Building Information Modeling, Willem Kymmell, 2008, Delmar Cengage.

5 BIM in Principle and Practice, David Wheatley, 2015, Routledge.

23SDCS05A - CLOUD BASED SECURITY SPECIALITY (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDCS05A	CLOUD BASED SECURITY SPECIALITY	CBSS	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of cloud computing and its security implications.	2	PO1, PSO1
CO2	Identify and assess various cloud security threats and vulnerabilities.	3	PO1, PSO1
CO3	Apply best practices for securing cloud infrastructure and services.	3	PO1, PO2, PSO1
CO4	Design and implement security measures to protect data in transit and at rest in the cloud.	4	PO2, PO3, PSO1

Syllabus

Introduction to Cloud Computing and Security- Overview of cloud computing models (IaaS, PaaS, SaaS)- Key concepts and benefits of cloud computing- Cloud security fundamentals and shared responsibility model.

Cloud Security Threats and Vulnerabilities-Common cloud security threats (DDoS, data breaches, etc.)- Vulnerabilities specific to cloud environments- Risk management and mitigation strategies

Securing Cloud Infrastructure- Best practices for cloud infrastructure security- Network security in cloud environments- Securing virtual machines and containers.

Data Security in the Cloud- Data encryption methods for cloud storage- Data integrity and confidentiality- Key management practices and tools

Reference Books

1 Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, 1st, O'Reilly Media.

2 Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS), Michael J. Kavis, 1st, Wiley.

3 Cloud Computing Security: Foundations and Challenges, John R. Vacca, 1st , CRC Press.

4 Securing the Cloud: Cloud Computer Security Techniques and Tactics, Vic (J.R.) Winkler, 1st, Syngress.

5 AWS Security Best Practices on AWS: Security and Compliance in AWS, Albert Anthony, 1st, Packt Publishing.

6 Practical Cloud Security: A Guide for Secure Design and Deployment, Melvin B. Greer, 1st, Addison-Wesley.

23SDCS06A - CERTIFIED GAME DEVELOPER (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDCS06A	CERTIFIED GAME DEVELOPER	CGD	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Mastery of Game Design Principles	2	PO1, PO4, PO8, PSO2
CO2	Proficiency in Game Programming	3	PO1, PO4, PO8, PSO2
CO3	Skill in 3D Modeling and Animation	3	PO1, PO4, PO8, PSO2
CO4	Expertise with Game Engines	4	PO1, PO4, PO8, PSO2

Syllabus

The origins of video games: From Pong to Pac-Man, Exploring different gaming genres: From platformers to RPGs, The impact of technological advancements on game development The rise of independent game development

Mechanics vs Dynamics vs Aesthetics (MDA): Deconstructing the game experience Core gameplay loops: Identifying the driving force of player engagement Systems thinking: Analyzing how interconnected mechanics create emergent gameplay Designing for different player types: Understanding motivations and goals

Introduction to Programming Paradigms: Procedural vs. Object-Oriented Exploring C++: A powerful and versatile language for game development (focus on core concepts) Learning C#: A popular choice for game development on the Unity platform (focus on core concepts) Demystifying Python: A beginner-friendly language for scripting and game logic (focus on core concepts)

Introduction to 3D Modeling: Polygons, vertices, edges, and the 3D space Interface exploration: Learning the layout and tools of Blender, Maya, and 3ds Max (choose one for primary use) Basic modeling techniques: Creating simple shapes, manipulating objects, and using modifiers Texturing fundamentals: Applying textures and materials to enhance realism

Reference Books

1 Jason Gregory,Game Engine Architecture,Second Edition , Jason Gregory , 2, 2014, Mike .

2 Tomas Akenine Mollar,Eric Haines,Naty Hoffman,Real Time Rendering,Third Edition , Tomas Akenine Mollar,Eric Haines,Naty Hoffman , 3, 2018, Direct X,Open GL .

3 James M Van Verth,Lars M Bishop,Essential Mathematics for Games and Interactive Applications,Third Edition , James M Van Verth,Lars M Bishop , 3, 2015, Direct X,Open GL(GLES) .

4 Jesse Schell,The Art of Game Design,A Book of Lenses, Fourth Edition , Jesse Schell , 4, 2023, IGDA .

5 Mike McShaffry,David Graham,Game Coding Complete, Fourth Edition , Mike McShaffry,David Graham , 4, 2012, Mike .

23SDCS12A - FULL STACK APPLICATION DEVELOPMENT (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDCS12A	FULL STACK APPLICATION DEVELOPMENT	FSD	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Students will gain a thorough understanding of Maven for project management and building automation and Hibernate for ORM in Java applications. They will learn to manage dependencies, automate builds, perform CRUD operations, write advanced queries, and handle inheritance in ORM, effectively integrating Java applications with databases.	3	PO3, PSO1
CO2	Students will gain a solid foundation in the Spring framework, including its architecture, core principles like Dependency Injection and Inversion of Control, and web development applications. They will be proficient in developing Spring-based web applications, performing CRUD operations, and integrating with relational databases, using Spring\'s features to create robust, maintainable Java applications.	3	PO3, PSO1
CO3	Students will gain a comprehensive understanding of Spring Boot and React JS for backend and frontend development. They will be proficient in building full-stack web applications, integrating RESTful web services, managing data with Spring Data JPA, and using React features like Hooks and Redux for state management.	3	PO3, PSO1
CO4	Students will understand both monolithic and microservices architectures and gain practical skills in building, deploying, and managing microservices with Spring Boot and Spring Cloud. They will be equipped to design and implement scalable, resilient, cloud-native applications using industry best practices and tools. Students will master advanced Spring Boot development.	3	PO3, PSO1

Syllabus

Maven-Introduction to Build Tools, Maven Build Tool and its advantages, Project Object Model(POM). Dependencies And Repositories, Maven Build Life Cycles, Phases and Goals, Maven Archetypes.

Hibernate-Introduction to ORM, JPA and its advantages. JDBC Vs Hibernate. Hibernate Architecture. Hibernate CRUD operations based on Persistence Object. Hibernate Query Language (HQL) & its operations. Hibernate Criteria Query Language (HCQL) & its operations. Generator Classes in Hibernate. Hibernate Inheritance Mapping.

Spring-Introduction to Spring and its advantages. Spring Architecture and modules. Dependency Injection and Inversion of Control with Primitive Data Types and Non-Primitive Data types using XML & Annotations. Autowiring using Dependency Injection and IoC. Spring Web Application MVC Architecture, JDBC Vs Hibernate Template. Spring Boot-Introduction to Spring Boot and Spring Vs Spring Boot. Spring Boot Architecture. Spring Boot Dependency Injection (DI) and Inversion of Controller (IoC). Spring Boot with Rest Controller and Controller. Spring Boot with Restful Web Services or REST API & Annotations.

Spring Boot Web Application MVC Architecture. Spring Data JPA & Repositories. DAO Layer, Repository Layer and Service Layer. Spring Boot Web MVC CRUD Application with Spring Data JPA. Spring Boot Web MVC with Pagination. React JS Component-based Architecture, React Hooks, Fetch/Axios API and React Router. Spring Boot Rest API CRUD operations with React JS. Spring Boot Web MVC CRUD Application with React JS. Microservices and Spring Cloud-Monolith Architecture vs. Microservices Architecture. Microservice with RestTemplate. Introduction to Spring Cloud, Spring Cloud Config Server & Client. Service Registry & Discovery with Netflix Eureka Client & Server. API Gateway with Spring Cloud Gateway.

Reference Books

1 The Full-Stack Developer , Chris Northwood , 1st ed. 2024, APRESS.

2 Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js , Greg Lim, 4th, 2023, Greg Lim.

3 Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 1st 2024, Apress - 2019..

4 Web Technologies: Concepts, Methodologies, Tools, and Applications, Information Science Reference, Arthur Tatnall , 4th edition, 2022, IGI Global.

5 MERN Quick Start Guide: Build web applications with MongoDB, Express.js, React, and Node.js, Eddy Wilson Iriarte Koroliova, 1st Edition, Packt Publishing-2019.

6 Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, Shama Hoque, 1st Edition, Packt Publishing-2020.

23SDEC01A - ELECTRONIC SYSTEM DESIGN (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDEC01A	ELECTRONIC SYSTEM DESIGN	ESD	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the concept of Discrete Semiconductors and other basiccomponents for different applications	3	PO1, PO2, PSO2
CO2	Apply basic electronic components to design circuit for various application	3	PO1, PO2, PO3, PSO2
CO3	Apply different Sensors, power supply designs and SpecialIntegrated Circuits for various applications	3	PO3, PO5, PSO2
CO4	Apply the NodeMCU development kit to post and fetch data from cloud database	3	PO2, PO3, PO5, PSO2
CO5	Apply the concept of schematic design convert to PCB Design using the software Easy EDA	3	PO2, PO3, PO5, PSO3

Syllabus

Basics of Electronics: Resistors - Application: Voltage Division Concept - Current Limiting Resistor - Pull Up and Pull-Down Resistor - Thermistor - Operating Principle and Types of Thermistors - LDR - Variable Resistor - Capacitor - Inductor - RC Time Constant - Other Basic Components: Diode - Switch - LED

Bridge Rectifier - Battery - Transistor - Transistor as A Switch - Fuse - Loudspeaker - Relay Concept - Transformer - Optocoupler - Microphone - Antenna

Sensors: Temperature and Humidity Sensors, Gas Detection Sensors, Power Supplies: 7805, 7905, Buck Converter, Boost Converter Integrated Circuits: LM393, 555 Timer, CD4017, L293D, L298N

NodeMCU: Introduction - Pin Configuration - Features - Applications - Software and Driver Tools, ESP8266 Boards Manager Package Installation - Posting Data to Cloud Database - Fetching Data from Cloud Database

Fetching Data from Cloud Database. Introduction to PCB & PCB Design with Easy EDA

Reference Books

1 Basic Electronics for Scientists and Engineers, Dennis L. Eggleston,, 2011, CambridgeUniversity Press.

2 Electronic Devices & Circuits, Jacob Millman, Christos C. Halkias, -, -.

3 IntegratedElectronics- Analog and Digital Circuits and Systems, Jacob Millman and Christos C. Halkias, -, -.

4 Linear Integrated Circuits, D Roy Choudhury, Shail B Jain, 2021, New Age International.

23SDEC02A - EMBEDDED SYSTEM AUTOMATION (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDEC02A	EMBEDDED SYSTEM AUTOMATION	ESDA	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Able to apply to expertly configure CPU clock speed, implement external interrupts, utilize timers for precise control, and optimize energy efficiency through power management modes in microcontroller-based systems.	3	PO2, PO3, PSO1
CO2	Able to apply UART, I2C, I2S, SPI, and CAN protocols, including pin configuration, multi-device communication, I2C scanner usage, and effective implementation in electronic systems.	3	PO2, PO3, PSO1
CO3	Able to apply ADC and DAC interfacing, EEPROM and Flash Memory usage, and master Bluetooth and Wi-Fi integration for wireless communication with reliable data links in electronic systems.	3	PO2, PO3, PSO2
CO4	Able to apply network operations, including scanning and signal identification, and proficiently handle MAC addresses, hostnames, and IP assignments for designing collaborative electronic systems.	3	PO2, PO3, PSO2

Syllabus

Microcontroller Development Board: CPU clock speed, External Interrupt, Timers & Timer Interrupt, Power Consumption in Each Mode & Sleep Modes

Communication Protocols: UART, I2C protocol: Set Pins, Multi Devices, I2C Scanner, I2S protocol, SPI Protocol, CAN Protocol

Memory & Interfaces: ADC, DAC with Audio Analog Output, EEPROM and its library, Flash Memory, Connectivity: Bluetooth, Wi-Fi

Networking: Network Scanning, Signal Strength Identifier, Connect to Network, Set and Get MAC address, Identification and change of Host name, Static & Dynamic IP assignment, Client-Server configuration and multi-server configuration

Reference Books

1. "ESP32 for Busy People", Neil Kolban, 2017, Leanpub.
2. "Programming ESP32 with Arduino IDE", Agus Kurniawan, 2018, Independently published.
3. "ESP32 Development Workshop", Agus Kurniawan, 2019, Independently published.
4. "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", Donald Norris, 2015, McGraw-Hill Education.
5. "ESP32 Projects and Tutorials", Wolfgang Beer, 2018, Independently published.
6. "Getting Started with Bluetooth Low Energy: Tools and Techniques for Low- Power Networking", Kevin Townsend, Carles Cuf?, Akiba, and Robert Davidson, 2014, O'Reilly Media.
7. "Mastering the FreeRTOS Real Time Kernel on the ESP32", Richard Barry, 2016, Real Time Engineers Ltd..
8. "ESP32 IoT Development with Zerynth", Ramneek Singh, 2021, Packt Publishing.
9. "ESP32 WiFi-BT-BLE MCU Module / ESP-WROOM-32", Espressif Systems, Varies, Espressif Systems.
10. "IoT Projects with ESP32: Build exciting and powerful IoT projects using the all-new Espressif ESP32", Agus Kurniawan, 2019, Packt Publishing.

11 "Wireless Communication Library for PIC Microcontrollers", Rizwan Waseer, 2015, Apress.

23SDEE04A - AI & ML FOR SMART GRIDS (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDEE04A	AI & ML FOR SMART GRIDS	AIMLSG	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Utilize AI tools to optimize smart grids by enhancing real-time energy distribution, minimizing outages, forecasting demand, and improving resilience with predictive analytics and machine learning.	3	PO2, PO5
CO2	Analyze Neural Network tools for designing and evaluating solutions, ensuring optimized performance and accuracy in complex simulations.Analyze Neural Network tools for designing and evaluating solutions, ensuring optimized performance and accuracy .	4	PO2, PO5
CO3	Analyze smart grid efficiency with simulation tools to identify improvements in energy distribution and performance. Ensure optimal operation and sustainability.	4	PO5
CO4	Analyze and evaluate AI and ML algorithms for anomaly detection and fault diagnosis in smart grids. Ensure precise identification and quick resolution for enhanced reliability and efficiency	4	PO2, PO5, PSO2

Syllabus

Introduction to Smart Grid Technology, Overview of smart grid components and architecture, Smart Grid Components and Subsystems, Energy storage systems

Energy storage systems for renewable energy integration, Microgrids and their role in renewable energy integration, Data mining and machine learning techniques for smart grid data analysis, AI-based control and optimization techniques for smart grid management

AI and ML applications in renewable energy integration, Cybersecurity and ethical considerations related to AI and ML in the smart grid

Anomaly Detection Techniques: Statistical methods, machine learning algorithms, and ensemble methods. Fault Diagnosis: Pattern recognition, fault localization, and decision support systems.

Reference Books

1. Artificial Intelligence-based Smart Power Systems, Sanjeevikumar Padmanaban, Sivaraman Palanisamy, Sharmeela Chenniappan, Jens Bo Holm-Nielsen, 2022, Wiley.
2. Applications of Artificial Intelligence in Planning and Operation of Smart Grids, Mehdi Rahmani-Andebili , 2022, Springer International Publishing.
3. Smart Grid: Fundamentals of Design and Analysis, James Momoh, 2012, John Wiley & Sons .
4. Smart Grid: Technology and Applications, Janaka Ekanayake, Nick Jenkins, and Kithsiri Liyanage, 2012, Wiley-IEEE Press.
5. Machine Learning for Smart Grids: Algorithms, Methodologies, and Applications, Chen-Ching Liu, Wade D. Smith, and Steven W. Su, 2017, CRC Press.
6. Artificial Intelligence Techniques for Smart Grids, Hongjian Sun, Yuguang Fang, and Huan Zhao, 2021, Springer.
7. Deep Learning Applications in Smart Grids, Siddhartha Kumar Khaitan, Jianhui Wang, and Bikash C. Pal, 2019, CRC Press.

23SDEE05A - MODELING AND SIMULATION OF GREEN ENERGY SYSTEMS (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDEE05A	MODELING AND SIMULATION OF GREEN ENERGY SYSTEMS	GML	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the fundamentals of MATLAB to renewable energy sources	3	PO1, PO5
CO2	Analyze the characteristics of solar PV system using MATLAB.	4	PO1, PO5
CO3	Analyze the characteristics of wind energy conversion system using MATLAB.	4	PO1, PO5
CO4	Analyze the characteristics of wind and solar hybrid system system using MATLAB.	4	PO1, PO5

Syllabus

Overview of MATLAB simulation, fundamentals of solar PV and wind energy conversion system.Measurement and analysis of current-voltage (IV) characteristics of a solar PV cell. Determination of fill factor and efficiency of a solar PV cell. .Effect of temperature on the output characteristics of a solar PV cell.

Solar PV System: V-I characteristics, effect of temperature, shading effect, fill factor, efficiency, irradiance impact, series and parallel connection of solar cells.

Wind Energy Conversion Systems: Power curve, effect of varying wind speeds, tip-speed ratio, impact of blade pitch angle.Determination of the tip-speed ratio of a wind turbine using MATLAB simulation and experimental validation.Study of the impact of blade pitch angle on the performance of a wind turbine.

Hybrid Energy: Simulation using MATLAB, Characteristics analysis.performance and efficiency of a hybrid energy system that combines solar PV and wind energy sources. impact of grid integration on the stability of the hybrid system, including the effects of grid faults, voltage fluctuations, and frequency deviations.

Reference Books

1 Wind Energy Explained: Theory, Design and Application, James F. Manwell, Jon G. Mnd edition (2010)cGowan, and Anthony L. Rogers., 2010, John Wiley & Sons..

2 Solar Energy Engineering: Processes and Systems, Soteris A. Kalogirou, 2013, Academic Press.

3 Wind Energy Handbook, Tony Burton, Nick Jenkins, David Sharpe, and Ervin Bossanyi, 2011, John Wiley & Sons.

4 Renewable Energy Sources, John Twidell & Toney Weir: E&F.N. Spon,, 2010, Taylor &Francis New York .

Y24: Bachelor of Arts (Economics & Public Policy)

Category: Second Major Flexi Core Courses (SMFC)

22CE1201 - ENGINEERING GEOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22CE1201	ENGINEERING GEOLOGY	EGY	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the significance of engineering geology, basics of geological processes that modify the surface of the earth, earthquakes, landslides	2	PO1, PO5, PO8, PSO2
CO2	Understand the basics of minerals and rocks, geological structures	2	PO1, PO5, PO8, PSO2
CO3	Understand the geological conditions to identify suitable site for civil engineering projects.	2	PO1, PO5, PO8, PSO2
CO4	Understand Geological conditions to identify potential sites for groundwater, sites for dam and reservoir and tunnels	2	PO1, PO5, PO8, PSO2
CO5	Apply and analyze the geological conditions for suitability of the site for a major civil engineering project	3	PO1, PO5, PO8, PSO2

Syllabus

INTRODUCTION: Importance of geology from Civil engineering point of view, PHYSICAL GEOLOGY: Introduction; Weathering Process, types of weathering and its importance in civil engineering; Soil formation, Soil profile, soil conservation measures; Geological action of Rivers, stages in a river system, features of river erosion and deposition. EARTHQUAKES AND SEISMIC HAZARDS: Terminology; Classification, Causes and effects of earthquakes; seismic waves, measuring instruments, seismic zones of India, Seismic belts, seismic hazards in India ; Civil Engineering considerations in seismic areas. A step towards urban earthquake vulnerability reduction LAND SLIDES: Classification; Causes and effects of Landslides; Preventive measures of Landslides.

MINERALOGY Definition of mineral; physical properties of minerals. Study of common rock forming minerals Quartz, Feldspar, Muscovite, Asbestos calcite, Talc, Kaolin PETROLOGY Introduction, Rock Cycle, major rock types, formation of Igneous rocks, Structures of Igneous rocks. Formation of Sedimentary rocks, Structures of Sedimentary Rocks. agents of metamorphism, Structures of Metamorphic rocks, distinguisition of major rock types, ENGINEERING PROPERTIES OF ROCKS Different Engineering property of rocks. Description of some important Rocks Granite Basalt Dolerite Sand Stone Lime Stone Shale Laterite Granite gneiss schist Marble Khondalite Charnockite. STRUCTURAL GEOLOGY Introduction; Strike and Dip Outcrop. Parts and classification of Folds Faults Joints and their importance in Civil Engineering constructions.

SITE INVESTIGATION TECHNIQUES FOR CIVIL ENGINEERING PROJECTS: Introduction, Different stages of site investigation, toposheets/topographic maps; Geological maps and their interpretation in site investigation; Geophysics in civil engineering, electrical resistivity investigations, seismic survey, remote sensing , Geographical information systems and their application

GROUND WATER sources of ground water, factors controlling ground water, water bearing properties of rocks and soils, types of aquifers, exploration of ground water DAMS Dams terminology Types of dams and suitable foundations guidelines for major dam and reservoir investigations TUNNELS Purpose of tunneling types of tunnels, tunnels and underground excavations methods of site selection, tunnel excavation in various rock types, geological problems, Geology of some tunnel sites

Reference Books

1 Engineering Geology, D.Venkat Reddy, 1, Vikas Publishing House Pvt.Ltd .

2 Engineering and General Geology, Parbin Singh, 2, S. K. Kataria & Sons.

3 Engineering Geology and Geo techniques, Krynine and Judd, 2, Mc Graw Hill Book Company. .

4 Engineering geology, Subinoy Gangopadhyay , 2, Oxford University Press.

5 Geology for Civil Engineers, C.D. Gribble, 1, Elsevier.

22CM1206 - ADVANCED COST ACCOUNTING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22CM1206	ADVANCED COST ACCOUNTING	ACA	R	3	2	0	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the cost concepts; cost classification, installation of costing system and Material costing Job Cost Cards, Collecting Direct Costs, Allocation of Over heads and its Applications	3	PO2
CO2	Apply the Labour cost and labour cost methods. Unit Costing and Multiple Costing, Application, Identification of Cost Unit and Cost Determination and Control	3	PO5
CO3	Apply the overhead cost and ascertainment of service department cost to production departments. Break even Analysis Cost Volume Profit Analysis P/V Ratio and its Significance - Margin of Safety	3	PO8
CO4	Apply the Job costing and contract costing. Various Types of Standards - Installation of Standard Costing System for Material, Labour and Overhead	3	PO8

Syllabus

Job Costing : Job Cost Cards, Collecting Direct Costs, Allocation of Over heads and its Applications. Batch Costing : Features and Applications, Contract Costing: Features, Distinction between Job and Contract Costing, Progress Payments, Retention Money, Escalation Clause, Contract Accounts, Accounting for Material, Accounting for Plant Used in a Contract, Contract Profit and Accounting Entries.

Features, Applications and Types of Process Costing, Process Loss, Abnormal Gains and Losses, Equivalent Units, Inter - Process Profit, Joint Products, By- Products and Accounting, Service Costing: Features and Applications, Unit Costing and Multiple Costing, Application, Identification of Cost Unit and Cost Determination and Control.

Meaning, Advantages, Limitations and Applications Break even Analysis Cost Volume Profit Analysis P/V Ratio and its Significance - Margin of Safety-Absorption Costing: System of Profit Reporting and Stock Valuation - Difference between Marginal Costing and Absorption Costing, Income Measurement under Marginal Costing and Absorption Costing-Application of Marginal costing techniques for decision making like make or buy decision, shut down decision, product mix decision, sales mix decision, key factor or limiting factor.

Definition, Significance and Applications Various Types of Standards - Installation of Standard Costing System for Material, Labour and Overhead, Variance Analysis for Materials, Labour and Over heads and Accounting Treatment of Variances - Benchmarking for Setting of Standards - Variance Reporting to Management.

Reference Books

1 Advanced Cost Accounting, M. N. Arora, June 2016, Vikas Publishing House.

2 Advanced Cost Accounting, B. B. Tandon, January 2013, S. Chand & Company Ltd..

3 Advanced Cost and Management Accounting, Saxena, V. / Vashist, C. D., February 2021, Sultan Chand & Sons.

4 Advanced Management Accounting, Robert S. Kaplan, Anthony A. Atkinson, Ella Mae Matsumura, S. Mark Young, August 2018, Pearson.

22CM21B2 - INCOME TAX LAW & PRACTICE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22CM21B2	INCOME TAX LAW & PRACTICE	ITLP	R	3	2	0	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understand the basics of Income tax law and its provisions in practical applicability, various terms used in income tax	2	PO7, PSO2
CO2	Apply the use of the treatment of calculation of Income from Salary, with consideration of allowances and hra and exmpeted allowances.	3	PO7, PSO2
CO3	Apply the knowledge of computing Income from House Property with calculation of different exemptions .	3	PO5, PSO2
CO4	Apply the knowledge to compute Income from Business, capital gains and other sources for the purpose of calculation of total income.	3	PO8, PSO2

Syllabus

Meaning and terms used: Person, Assessee, Previous year, Assessment year, Income, Gross Total Income, Total Income, Agricultural Income, and Exempted Income ,Fully exempted , Partially Exempted Residential Status: Rules for determining residential status of Individual, HUF, Firm and Company, need to determine residential status, Incidence of tax and residential status, Practical problems.

Salary, Allowances, perquisites and retirement benefits, deductions, computation of salary income.

Annual Value, let out property, self occupied properties, deductions, computation of house property income

Depreciation and other permissible deductions, Disallowable expenses, income and expenses of illegal business, computation of Business income , Income from Profession Capital Incomefrom other sources, Specific income, deductions, grossingup, computation of income from other sources, practical problems.

Reference Books

1 Law and Practice of Income tax, Bhaghavathi Prasad, 2020, , New Age International Publisher New Delhi.

2 , Direct Taxes Law and Practices, 2. Vinod K. Singhania, 2018, Taxmann Publications.

3 Income Tax Law & Practice , jain and narang, 2022, kalyani.

4 Principles of Taxation and Tax Laws, S R Myneni, 2022, Allaha.

22CM31B5 - ACCOUNTING & REPORTING STANDARDS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22CM31B5	ACCOUNTING & REPORTING STANDARDS	ARS	R	3	2	0	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the accounting standards and its application.Accounting Standards Interpretations and Guidance Notes on various accounting aspects issued by the ICAI and their applications.	2	PO1, PO9, PSO3
CO2	Have knowledge in International Accounting standards.nternational Financial Reporting Standards (IFRS), Interpretations by International Financial Reporting Interpretation Committee (IFRIC)	3	PO1, PO9, PSO3
CO3	Know about the corporate financial reporting. Merchant bankers, Stock and commodity market intermediaries - Meaning, recognition, derecognition	3	PO3, PSO3
CO4	Learn the developments in financial reporting. Measurement of financial instruments - Hedge accounting - Disclosures	3	PO3, PSO3

Syllabus

Accounting Standards, Accounting Standards Interpretations and Guidance Notes on various accounting aspects issued by the ICAI and their applications.

Contingencies and Events occurring after the Balance Sheet Date, AS 5 : Net Profit or Loss for the Period, Prior Period Items and Changes in Accounting Policies

International Financial Reporting Standards (IFRS), Interpretations by International Financial Reporting Interpretation Committee (IFRIC), International Accounting Standard Board (IASB), structure of IASB, Worldwide accounting diversity, Factors leading to diversity, Harmonization of accounting standards, need for harmonization,

Understanding of US GAAP - Applications of IFRS and US GAAP Significant differences between US GAAP and Indian GAAP, US GAAP & IFRS, IFRS and Indian Accounting Standards. s.

Reference Books

1 Acounting Standards,, Vijay Kumar,, 10th Edition,2011, Asia Law House, 2011, New Delhi.

2 Accounting Standards and Corporate Accounting Practices, T. P. Ghosh, 12th Edition,2011, Taxman Publications.2011, New Delhi..

3 Taxman Students Guide to Accounting Standards, D. S. Rawat, 18th Edition,2011, Taxman Publications,2011, 18th Edition, New Delhi.

4 Advance Accounting II, M.C. Shukla and T.S. Grewal, 15th Edition,2011, S. Chand and Co 2011.

6 Taxman Accounting Standards, D. G. Sharma and Srinivasan Anand, 7th Edition,2010, Taxman Publications, 2010, 7th Edition, New Delhi..

22FT1102 - FOOD CHEMISTRY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT1102	FOOD CHEMISTRY	FC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the chemical composition of food and behavior of water in food.	2	PO5
CO2	Apply micro-nutrients in foods and toxicity.	3	PO5
CO3	Apply food pigments, pigmentation processes in foods, and colloids.	3	PO5
CO4	Apply understanding of dispersions and gels; effects of processing on chemical composition.	3	PO5
CO5	Apply the knowledge to estimating various chemical properties of foods and their components.	3	PO5

Syllabus

Need for learning food chemistry. To study fundamentals of food chemistry. To study chemical composition of various foods. State of water in food. Structure of water and ice. Types of water. Interaction of water with solutes. Sorption phenomenon. Water activity and its relation with packaging and spoilage.

Classification of vitamins. Structures of vitamins. Properties of vitamins. Functions of vitamins. Stability of vitamins. Major minerals in foods. Minor minerals in foods. Metal uptake. Toxic metals in foods.

Food pigments - Introduction and classification. Structures and properties of food pigments. Browning Reactions in foods (Enzymatic). Browning Reactions in foods (Non-enzymatic, Maillard). Browning Reactions in foods (Caramelization, Ascorbic acid oxidation). Introduction to colloids. Colloids from proteins (classification and structure). Colloids from proteins (plant- and animal-based). Colloids from carbohydrates (classification and structure). Colloids from carbohydrates (chemical reactions, modifications). Stabilization of colloidal system and application of colloidal chemistry to food preparation.

Introduction to dispersions. Characterization of dispersions. Types of dispersions and gels. Gels and syneresis. Emulsions and foams. Effects of processing on chemical composition (Physico-chemical changes). Effects of processing on chemical composition (Nutritional changes). Effects of processing on chemical composition (drying). Effects of processing on chemical composition (irradiation). Effects of processing on chemical composition (freezing, canning).

Estimation of moisture content. Determination of moisture sorption. Determination of pH of a food. Estimation of total ash. Determination of titratable acidity. Standardization of NaOH solution. Estimation of total fat content in a food. Determination of degree brix of food products.

Reference Books

1. Water Properties of Food, Pharmaceutical, and Biological Materials., Maria del Pilar Buera, Jorge Welti-Chanes, Peter J. Lillford, Horacio R. Corti, 1 (2006), Blackwell Publishing.
2. Water activity in foods: fundamentals and applications., Gustavo V. Barbosa-C?novas, Anthony J. Fontana Jr., Shelly J. Schmidt, Theodore P. Labuza, 1 (2020), Blackwell Publishing & IFT.
3. Food Colloids: Proteins, Lipids and Polysaccharides, E Dickinson, B Bergenstahl, 1 (1997), Woodhead Publishing Limited.
4. Food Chemistry, Lillian Hoagland Meyer, 3 (2006), Avi Pub Co..

22FT1104 - INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT1104	INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY	IFST	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	understand the basic principles of food science and technology.	2	PO1, PO6, PO8
CO2	Determine the structure, composition, nutritional quality and postharvest changes of various plant foods.	3	PO1, PO6, PO8, PO10
CO3	Determine the structure and composition of various animal foods	3	PO1, PO6, PO8
CO4	Discover about various dairy products	3	PO1, PO6, PO8, PO10
CO5	Demonstrate use various basic food processing techniques with an aim to preserve the foods	3	PO1, PO6, PO8

Syllabus

historical evolution of food processing technology. Cereals and millets Structure and composition, properties and nutritional attributes of rice, wheat, maize, barley, millet and oats, malting, gelatinization of starch, types of browning Maillard & caramelization, rice parboiling of rice advantages and disadvantages.

Structure and composition of pulses, toxic constituents in pulses, processing of pulses soaking, germination, decortications, cooking and fermentation. Fats and Oils-classification of lipids, types of fatty acids saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, and hydrogenation. Rancidity Types- hydrolytic and oxidative rancidity and its prevention.

Fruits and Vegetables-Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fiber. Post-harvest changes in fruits and vegetables Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

Introduction to poultry and dairy sectors

Performing various practical to Study different types of browning reactions: enzymatic and non-enzymatic, gelatinization behavior of various starches To study the concept of gluten formation of various flours To study malting and germination To study dextrinization in foodsIdentification of pigments in fruits and vegetables and influence of pH on them Quality inspection of animal foods Study of effect of heat on sugar etc

Reference Books

1 Food Science, Bawa. A.S, O.P Chauhan et al., 2013, New India Publishing agency.

2 Food Science, Roday,S, 2011, , Oxford publication.

3 Food science, B. Srilakshmi, 2002, New Age Publishers.

4 Outlines of Dairy Technology, De Sukumar, 2007, Oxford University Press.

22FT1105 - FOOD BIOCHEMISTRY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT1105	FOOD BIOCHEMISTRY	FBC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand basics of Organic chemistry and its role in food To understand applications of biochemistry and its role in food industries in various departments	2	PO1, PO3, PO5, PO6
CO2	Applying basic priciples to determine the structural and chemical nature of nutrients CHO & Proteins.	3	PO1, PO3, PO5
CO3	Applying basic priciples to determine the structural and chemical nature of nutrients Lipids & Nucleic acids.	3	PO1, PO3, PO6
CO4	Applying basic priciples to identify the metabolic changes of foods once it enters the human body.	3	PO1, PO3, PO5
CO5	Anlayzing biochemicals and to demonstrate the knowledge of characterization of food components.	4	PO1, PO3, PO6

Syllabus

Introduction To Biomolecules - Overview - Basic principles of Organic Chemistry, Types of Biomolecules, Chemical nature, biological roles, biological buffers, Water and its importance in Biochemistry.

Structure and properties of Carbohydrates and Protiens in detail. forms of Isomerism, Physiological importance, Polysaccharides StarchglycogenCellulose and their derivativesChitin-Peptidoglycans- Glycosaminoglycan-Glycoconjugates, Test for Carbohydrates. Classification of Amino acids and Proteins, Structure of ProteinsPrimary-SecondaryTertiary Myoglobin Hemoglobin

Structures & Properties Of Lipids, Nucleic Acids - Lipid - Classification Physiological importance, Significance of Cholesterol, Nucleic Acids - Ribonucleic acids - Deoxyribonucleic acids, Functions of Nucleotides -Regulatory Molecules.

Metabolic activities of biomolecules, significance of vitamins and minerals Kerbs cycle, TCA, Gluconeogenisis

Analyzing various biomolecules in foods study of their chemical nature and estimation of carbohyddrates proteins and fats by chemical analysis

Reference Books

1 Biochemistry, LubertStryer, 4th Edition 2000, WH. Freeman and co., 2000..

2 Food Biochemistry and Food Processing, Benjamin K. Simpson Ph.D, 2012, John Wiley & Sons, Inc..

3 FOOD BIOCHEMISTRY, DICKSON JK, 2020, CBS PUBLISHERS & DISTRIBUTORS PVT. LTD DICKSON JK.

4 Biochemistry Practical Book for Biomolecules & Food Analysis, Dr R Subashini, 2022, LAPublishers.

5 Fennema's Food Chemistry, Srinivasan Damodaran, Kirk L. Parkin, 5th Edition 2007, CRC Press.

22FT1207R - FOOD MICROBIOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT1207R	FOOD MICROBIOLOGY	FMB	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Summarize the important microorganisms affecting food and human health.	2	PO3, PO6, PO8
CO2	Develop the nature of different microorganisms associated with food and their growth.	3	PO3, PO6, PO8
CO3	Identify the knowledge regarding the role of microbes in fermentation, spoilage and food-borne diseases.	3	PO3, PO6, PO8
CO4	Determine the spoilage of foods by common microorganisms, and cultivation of microorganisms	3	PO3, PO6, PO8
CO5	Demonstrate the knowledge in terms of testing aspects of food microbiology	3	PO6, PO8

Syllabus

History of microbiology, differences between Prokaryotes and Eukaryotes, Contributions of Louis Pasteur classification of Microbes and Detailed structure of Prokaryotic cell, light and electron microscope, Staining techniques, Gram staining. Characteristics and classification of fungi yeast and moulds.

Types of Sterilization, Nutritional classification of microorganisms, types of media, microbial culture collection. Isolation of Microbes platings, serial Dilution, Microbial Growth and Metabolism, Growth curve, Factors affecting Growth of microorganisms in food.

Importance of microorganisms in food , primary sources of microorganisms in food , intrinsic and extrinsic parameters of food affecting microbial growth , types of microorganisms in foods like meats, poultry, seafood, vegetables, dairy products, fruits and vegetables. Starter Cultures.

principles and types of spoilage, microbial spoilage of foods Microbial spoilage of Fruits, Vegetables, Grains and grain products, Meat, Poultry Fish, Factors influencing the spoilage and control, Measures to prevent microbial food

Reference Books

1 Fundamental Food Microbiology , Bibek Ray , 3rd, CRC Press.

2 "Food Safety Culture Creating a Behavior-Based Food Safety Management System" , Frank Yiannas , 4th, Springer New York, NY .

3 Handbook of Culture Media for Food Microbiology. , Janet E.L. Corry, G.D.W. Curtis and Rosamund M. Baird (Eds.) , Third, RSC Publishing .

4 Safety of Meat and Processed Meat. , Francis F. Busta , Bruce R. Cords , "Fidel Toldra? Editor", Springer .

22FT12C1 - PRINCIPLES OF FOOD PRESERVATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT12C1	PRINCIPLES OF FOOD PRESERVATION	PFP	R	1	0	0	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts of food preservation technologies	2	PO1, PO5, PO7, PSO2
CO2	Apply conventional techniques for preserving foods	3	PO1, PO5, PO7, PSO2
CO3	Apply modern filtration technologies for food preservation	3	PO1, PO5, PO7, PSO2
CO4	Apply novel non-thermal food processing technologies for preservation of foods	3	PO1, PO5, PO7, PSO2
CO5	Apply the concepts for preservation of foods using different techniques	3	PO1, PO5, PO7, PSO2

Syllabus

Introduction to food preservation techniques: History, Scope and principles of food preservation; Preservation Methods-preservation by low temperature - processing, mechanism, refrigeration, chilling, freezing, freezing curve, changes occurring during freezing, types of freezing, thawing, and its effects.

Preservation by high temperature Different thermal operations sterilization, pasteurization, blanching, and UHT processing Canning canning equipment and operations. Types of canning containers. Thermal destruction of microorganisms D value, F value, Z value. Advantages and limitations. Chemical food preservation Types of chemical preservatives and their functions synthetic, natural permissible limits and safety aspects. Advantages and limitations.

Introduction to membrane processing General principles, dead end and cross flow, Classification of membrane system Reverse Osmosis. Classification of membrane system Nano Filtration, Ultra Filtration, Micro Filtration, Electrodialysis and Pervaporation. Commercial examples. Advantages and limitations.

Introduction to Irradiation, microwave, radio frequency, high pressure processing, pulsed electric field, hurdle technology. Ohmic heating, cold plasma, modified atmosphere packaging, vacuum packaging, aseptic processing, ultrasound. Advantages and limitations

Food Sampling for Analysis, Effect of blanching of fruits and vegetables on sensory properties, A comparative anaysis of the sun and oven drying of fruits and vegeables, Effect of pasteurization on the microbial load of milk and fruit juice, Preparation of feremented products

Reference Books

1 Physical Principles of Food Preservation , Marcus Karel, Daryl B. Lund, 2nd - 2003, Marcel Dekker, Inc.

2 Food Processing Technology, Principles and Practice, J. P. Fellows, 5th - 2022, Wood Head Publishing.

3 Food Science, N. N. Potter and J. H. Hotchkiss, 5th - 1995, Springer.

4 Food Processing: Principles and Applications, H. Ramaswamy, M. Marcotte, 1st - 2005, CRC Press.

5 Preservation of Fruits and Vegetables, B. Lal, G. B. Siddappa and G. N. Tandon,, 2nd - 2009, ICAR.

6 Food Processing and Preservation, B. Sivasankar, 2nd - 2004, PHI Learning Pvt Ltd.

22FT2109R - PROCESSING OF HORTICULTURAL PRODUCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT2109R	PROCESSING OF HORTICULTURAL PRODUCE	PHP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the concepts of processing of fruits and vegetables	2	PO1, PO5, PO7, PSO2
CO2	Apply the concepts of the processing and market potential of the processed fruits and vegetables	3	PO1, PO5, PO7, PSO2
CO3	Apply post-harvest techniques for storage of fruits and vegetables	3	PO1, PO5, PO7, PSO2
CO4	Apply advanced techniques in processing of horticultural produce	3	PO1, PO5, PO7, PSO2
CO5	Apply processing techniques for preparation of value added products	3	PO1, PO5, PO7, PSO2

Syllabus

Different types and importance of horticultural produce, need and market potential for processing the produce, nutritional aspects

Reasons of spoilage, physical (moisture and temperature), chemical (browning, etc.), and biological (microbes, insects) factors of spoilage, physical and chemical methods of spoilage control: sanitation, fumigation, etc

Underground and above ground storage, godowns, containers, storage conditions, sanitation requirements and methods

Canning and bottling: Process factors and parameters, equipment, containers used, advantages and limitations. Beverage making: Juice extraction, deaeration, straining, filtration and clarification; preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation). Squashes: Processing, cordials, nectors, concentrates and powder. Jams: Constituents, selection of fruits, processing & technology. Jellies: Essential constituents (Role of pectin, ratio), theory of jelly formation, processing technology, defects. Marmalades: Types, preparation, processing technology, defects. Pickles, chutneys and sauces: Processing, types, spoilage and preservation. Tomato products: Selection of tomatoes, preparing pulp, juice, puree, paste, ketchup, sauce and soup of tomatoes. Dehydration: Sun drying and mechanical dehydration, process variations, packing and storage. Additives: Preservatives, colorants, acidity regulators

Estimation of total soluble solids (TSS). Estimation of pH and acidity of products. Estimation of brix/acidity ratio. Estimation of ascorbic acid and effect of heat treatment on it. To study the steps of can making process. Preparation and evaluation of pectin products. Dehydration of fruits and vegetables

Reference Books

1 Preservation of fruits & Vegetables, Girdharilal, Siddappaa, G.S and Tandon, G.L, 1st - 2009, ICAR.

2 Postharvest technology of fruits and vegetables: General concepts and principles, L.R. Verma, and Dr. V.K. Joshi, 1st - 2000, Indus Publishing Company.

3 Foods: Facts and Principles, Manay, S and Shadaksharaswami, M, 1st - 2001, New Age Publishing Pvt Ltd.

4 Commercial food and vegetable products, W B Cruess, 3rd - 2009, McGraw - Hill .

22FT2213R - BAKERY, CONFECTIONERY AND SNACKS TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT2213R	BAKERY, CONFECTIONERY AND SNACKS TECHNOLOGY	BCST	R	2	0	4	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the science and technology behind bakery and confectionary products and their place in global market.	2	PO4, PO6, PO8
CO2	Apply the concepts of the functioning of ingredients in baking and confectionary.	3	PO4, PO6, PO8
CO3	Apply the formulation concepts for bakery and confectionary products	3	PO4, PO6, PO8
CO4	Apply the concepts of food safety regulations for baked and snack products	3	PO4, PO6, PO8
CO5	Apply the concepts and knowledge of baking and confectionery for preparing value added products	3	PO4, PO6, PO8

Syllabus

Introduction to bakery products: Definition, classification, market, Ingredients and their functions; Machines & equipment for batch and continuous Processing of bakery products, major and minor equipment. Manufacturing of Breads, cakes, types of icings, pizza base, biscuits, cookies, rusk, pastry as per FSSAI standards

Introduction to Confectionary and chocolate Products: Types, specifications, compositions, role of ingredients, other aerating agents, cocoa powder, fruits, preserved fruits, dried fruits, nuts and chemical additives. Manufacturing of products - jam, gums, jellies, candies fondant, caramel, fudge, toffee, types of chocolate etc.

Production of bakery foods: Formulation - Ingredients (flour, yeast, sugar, egg, butter, salt, baking powder, coloring and flavoring agents, starches) and their functions, methods, classification, standards. Equipment: Cleaning, operation, processes, quality checks, preservation (conventional and evolving preservatives), regulations. Baking processes, quality of baked products

Safety Measures & Regulations: Food safety rules and regulations for bakery and confectionary products-Layout, hygienic conditions required for bakery plant, operation and maintenance of bakery equipment

Identifications and composition of various ingredients for snacks, bakery and confectionery products 2. Preparation and quality assessment of pizza base 3. Preparation and quality assessment of bread 4. Preparation and quality assessment of different types of cakes. 5. Preparation and quality assessment of cookies and biscuits 6. Preparation of selected varieties of chocolates and toffees 7. Preparation, and quality assessment of selected snack items 8. Preparation of selected varieties of macaronis. 9. Visit to a baking industry and preparation of report

Reference Books

1 Bakery technology - packaging, nutrition, product development, quality assurance, Samuel A. Matz, 1st - 1989, Chapman - Hall.

2 Textbook of Bakery and Confectioner, Yogambal Ashokkumar, 3rd - 2023, Prentice Hall India Learning Private Limited.

3 Bakery products: science and technology, Weibiao Zhou, Y. H. Hui, I. De Leyn, M. A. Pagani, C. M. Rosell, J. D. Selman, N. Therdthai, 2nd - 2014, Wiley.

4 Complete Confectioner, Glasse, Hannah, 1st - 2018, Gale Ecco Print Editions.

5 Textbook of Bakery and Confectionary, Sivalingam, Yogambal , 3rd - 2023, Prentice Hall India Learning Private Limited.

22FT3215R - TECHNOLOGY OF MEAT AND POULTRY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT3215R	TECHNOLOGY OF MEAT AND POULTRY	TMP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the meat and poultry market and preservation technologies for meat products	2	PO2, PO4, PO6, PSO2
CO2	Apply processing techniques for meat preservation	3	PO2, PO4, PO6, PSO2
CO3	Apply processing technologies for presevation of poultry and eggs	3	PO2, PO4, PO6, PSO2
CO4	Apply principles of plant sanitation in preventing contamination of meat products	3	PO2, PO4, PO6, PSO2
CO5	Apply principles for processing and preservation for meat, poultry, and eggs	3	PO2, PO4, PO6, PSO2

Syllabus

Introduction to Meat and Poultry Technology Current status of meat and poultry industry in Indian and global markets, preferences, demand, availability, market size, regulatory requirements. Sources animals and birds and products derived from thereof. Structure of muscle chemical composition and nutritive value of meat. Preservation requirements of meat, poultry, and egg modes of deterioration, effect of deterioration on quality.

Processing and Preservation of Meat and Poultry Preslaughter and slaughter operations plant conditions, post mortem changes influencing quality, grading, aging, mechanical deboning. Cutting, handling, and tenderization. Preservation chilling, freezing, pickling, curing, cooking and smoking, canning, dehydration, radiation, chemical and biological preservatives, packing, and storage. Quality of raw and processed meat parameters and evaluation. Utilization of byproducts

Processing and Preservation of Egg Structure of egg, chemical composition of egg, nutritive value and functional properties of egg. Grading and packing of eggs and egg products. Preservation of egg preservation of shell egg and liquid egg. Whole egg powder, egg yolk, products, byproducts, their packing and storage.

Safety Requirements for meat, poultry, and egg Safety requirements Contamination of meat, poultry, and egg products in absence of sanitation potential health effects on consumers, pathogenic outbreaks. Sanitation methods, procedures. Standards Regulations in some important markets USA, EU, UK, etc.. Certifications KOSHER, HALAL, etc

Study of different primal cuts, Preservation of meat at low temperatures, Preservation of meat at high temperatures, Handling of meat, Preservation of meat by curing, Preservation of meat by pickling, Study of value added products, Study of different packing methods of meat products Visit to an abbatoir

Reference Books

1 Textbook on Meat, Poultry and Fish Technology, Jhari Sahoo and Manish Kumar Chatli, 2nd - 2020, Daya Publishing House.

2 Meat, Egg and Poultry Science & Technology, Vikas Nanda, 1st - 2013, I.K. International Publishing House.

3 Outlines of Meat Science and Technology, Sharma, B.D. and Kinshuki Sharma, 1st - 2011, Jaypee Brothers Medical Publishers Pvt. Ltd.

4 Meat Cuts and Muscle Foods, Howard J. Swatland, 2nd - 2004, Nottingham University Press.

5 Meat and Meat Products: Technology, Chemistry and Microbiology, Alan H. Varnam and Jane P. Sutherland, 1st - 1995, Chapman and Hall.

22FT32C2R - FOOD PACKAGING TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
22FT32C2R	FOOD PACKAGING TECHNOLOGY	FPT	R	1	0	0	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand designing and development of safe food packaging material.	2	PO7, PSO3
CO2	Apply packaging requirement for food products and different types of food packaging systems.	3	PO7, PSO3
CO3	Apply various packaging materials and equipment used in packaging industry.	3	PO7, PSO3
CO4	Apply suitable packaging for a given food product.	3	PO7, PSO3
CO5	Apply the learning toward establishing marketable food products.	3	PO7, PSO3

Syllabus

Outline of Food packaging: Need, Role of packaging in extending shelf life of foods, designing packaging materials, testing of packaging materials, package performance tests, Principles of developing safe and protective packing, Safety assessment of food packaging materials.

Food packaging systems: Product characteristics and package requirements, Introduction of food packaging system, Different forms of packaging, Rigid, semi-rigid, flexible forms of packaging, Different packaging system for-Dehydrated foods, Frozen foods, Dairy products, Fresh fruits, Vegetables, Meat, Poultry, Sea foods.

Packaging materials. Types, characteristics, uses. Paper (Pulping, Fibrillation, Beating, Types of papers, testing methods). Glass (Composition, Properties, Types, Methods of bottle making. Metals (Tinplate, Types of cans, Aluminum containers, Lacquers). Plastics (Types, films, laminated and co-extruded plastic materials).

Package accessories and advances in Packaging technology. Introduction, Active packaging, MAP, Aseptic packaging, Packages for convenience, Biodegradable plastics, Coatings. Packaging equipment and machinery (Vacuum packaging, CA & MA packaging, Sealing, shrink packaging, FFS, Aseptic packaging, Retort, Bottling, Carton making, Printing).

Packaging technology to preserve perishable foods. Select perishable foods. Identify their preservation requirements to achieve a longer shelf-life. Design a suitable packaging for the select foods by conducting the necessary testing.

Reference Books

1 A Handbook of Food Packaging , P. John Jacob , 2010, Daya Publishing House .

2 Handbook of Food Packaging Technology , EIRI Board , 2015, EIRI Board .

3 Fundamentals of Packaging Technology , Walter Soroka , 2009, IOPP.

4 FOOD PACKAGING: PRINCIPLES AND PRACTICE , ROBERTSON L. GORDON , 2016, CRC Press.

23ACCAMA - MANAGEMENT ACCOUNTING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ACCAMA	MANAGEMENT ACCOUNTING	MA	R	3	2	0	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the need of Management Accounting & cost accounting techniques, Accounting for management Sources of data Cost classification presenting information.	3	PO2
CO2	Develop budgeting techniques, Nature and purpose of budgeting statistical techniques budget preparation flexible budgets capital budgeting and discounted cash flow budgetary control	3	PO8
CO3	Make use of standard costing and variance analysis techniques, Standard costing system variance calculations and analysis reconciliation of budgeted and actual profits.	3	PO8
CO4	Apply the performance measurement techniques to measure the performance Performance measurement overview performance measurementapplication cost reductions and value enhancement	3	PO5

Syllabus

The nature, source and purpose of management information: Accounting for management Sources of data Cost classification presenting information. Cost accounting techniques: Accounting for material, labour and overheads absorption and marginal costing cost accounting methods alternative cost accounting principles.

Budgeting: Nature and purpose of budgeting statistical techniques budget preparation flexible budgets capital budgeting and discounted cash flow budgetary control and reporting behavioral aspects of budgeting.

Standard Costing: Standard costing system variance calculations and analysis reconciliation of budgeted and actual profits.

Performance measurement: Performance measurement overview performance measurementapplication cost reductions and value enhancement monitoring performance and reporting.

Reference Books

1 Management Accounting: Principles and Applications, Leslie G. Eldenburg, Susan K. Wolcott, and Christopher T. Staley., 18 April 2005, Wiley.

2 Management Accounting: Information for Decision-Making and Strategy Execution, Anthony A. Atkinson, Robert S. Kaplan, S. Mark Young, and Ella Mae Matsumura. Edition: , 17 March 2011, Pearson.

3 Management and Cost Accounting, Colin Drury. Edition, 1 January 2014, Cengage Learning EMEA..

4 Management Accounting Concepts and Technique, Gary L. Sundem, William O. Stratton, John A. Schatzberg, Dave Burgstahler, 15 March 2006, Wiley.

23ACCAPM - PERFORMANCE MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ACCAPM	PERFORMANCE MANAGEMENT	PM	R	3	2	0	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand and acquire decision making techniques under limiting factors.	2	PO9, PSO1
CO2	Develop skills in dealing with decision-making processes under short-term, risk and uncertainty.	3	PO8, PSO1
CO3	Apply and acquire skills in dealing with budgetary systems and Standard costing.	3	PO5, PSO2
CO4	Apply knowledge and skills to analyze and manage financial performance through budgeting and control techniques.	3	PO9, PSO3

Syllabus

Specialist cost and management accounting techniques - Activity based costing, Target costing, Life-cycle costing, Throughput accounting, and Environmental accounting.Decision-making techniques - Relevant cost analysis- Explain the nature of CVP analysis, Calculate and interpret the break-even point and margin of safety, Calculate the contribution to sales ratio, in single and multi-product situations, and demonstrate an understanding of its use, Calculate target profit or revenue in single and multi-product situations, and demonstrate an understanding of its use, Prepare break even charts and profit volume charts and interpret the information contained within each, including multi-product situations, Discuss the limitations of CVP analysis for planning and decision making. Decision-making techniques - Limiting factors - Identify limiting factors in a scarce resource situation and select an appropriate technique, Determine the optimal production plan where an organisation is restricted by a single limiting factor, including within the context of make or buy decisions, Formulate and solve multiple scarce resource problem both graphically and using simultaneous equations as appropriate, Explain and calculate shadow prices and discuss their implications on decision-making and performance management, Calculate slack and explain the implications of the existence of slack for decision-making and performance manage -Pricing decisions - Explain the factors that influence the pricing of a product or service, explain the price elasticity of demand, Derive and manipulate a straight line demand equation. Calculate the optimum selling price and quantity for an organisation, equating marginal cost and marginal revenue, Evaluate a decision to increase production and sales levels, considering incremental costs, incremental revenues and other factors, Determine prices and output levels for profit maximization using the demand based approach to pricing , Explain different price strategies, Calculate a price from a given strategy using cost-plus and relevant cost.

Decision making techniques Make or buy and other short term decisions Explain the issues surrounding make vs. buy and outsourcing decisions, Calculate and compare make costs with buyin costs, Compare in-house costs and outsource costs of completing tasks and consider other issues surrounding this decision, Apply relevant costing principles in situations involving shut down, one-off contracts and the further processing of joint products.Decision making techniques Dealing with risk and uncertainty in decision making Suggest research techniques to reduce uncertainty e.g. Focus groups, market research, Explain the use of simulation, expected values and sensitivity, Apply expected values and sensitivity to decision making problems. Apply the techniques of maximax, maximin, and minimax regret to decision making problems including the production of profit tables, Draw a decision tree and use it to solve a multi-stage decision problem, Calculate the value of perfect and imperfect information.

Budgeting and Control Budgetary systems and types of budget Explain how budgetary systems fit within the . performance hierarchy, Select and explain appropriate budgetary systems for an organisation, including topdown, bottom-up, rolling, zero-base, activitybase, incremental and feed-forward control, Describe the information used in budget systems and the sources of the information needed, Indicate the usefulness and problems with different budget types including fixed, flexible, zero-based, activity- based, incremental, rolling, top-down, bottom up, master, functional, Prepare rolling budgets and activity based budgets Explain the beyond budgeting model, including the benefits and problems that may be faced if it is adopted in an organisation,Budgeting and Control Quantitative analysis in budgeting Apply the learning curve to a budgetary problem.

Budgeting and Control - variances-Budgeting and Control - Performance analysis - Analyse and evaluate past performance using the results of variance analysis, Use variance analysis to assess how future performance of an organisation or business can be improved,Identify the factors which influence behaviour, Describe the dysfunctional nature of some variances in the modern environment of JIT and TQM, Discuss the behavioural problems resulting from using standard costs in changing environment.

Reference Books

1 Performance Management, BPP Learning Media, 6th, 2013, BPP Learning Media.

2 Performance Management, Kaplan Publishing, 5th 2012, Kaplan Publishing.

3 Performance Management, Becker Professional Education, 8th,2010, Becker Professional Education.

4 Performance Management, London School of Business and Finance, 5th,2010, London School of Business and Finance.

5 Performance Management, Emile Woolf International, 9th,2015, Emile Woolf International.

23ACCATX - TAXATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ACCATX	TAXATION	TXT	R	3	2	0	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Basic Concepts of Direct Taxes topics covered includes Basic Concepts of Fiscal Policies & Definitions, assessment year, previous year, person, assessee, Income, charges on income, gross total income, capital and revenue receipts, residential status etc.,	2	PO1
CO2	Apply Computation of Total Income and Tax Liability comprises of topics like ncome from salaries, Income from house property, Profits and Gains from business or Profession, Capital Gains and Income from other sources, Aggregation of income, Carry forward and set off of losses, Gross Total Income, Deductions under Chapter VI A, Total Income	3	PO1
CO3	Develop Corporate Tax Planning covering the topics Computation of total income and tax liability of corporate entities with Minimum Alternate Tax, Corporate Dividend Tax, Exemptions available to companies in SEZ, Tax holidays, Tax implications of Corporate Restructuring	3	PO3
CO4	Apply Tax Authorities, Assessment Procedure and Rules topics covering Income Tax authorities and functions, Deduction and collection of tax a source, advance tax and interest, return of income and assessment procedure, Refunds, penalties and prosecution, appeals and revision, Settlement of cases etc.,	3	PO5

Syllabus

Basic Concepts of Fiscal Policies & Definitions, assessment year, previous year, person, assessee, Income, charges on income, gross total income, capital and revenue receipts, residential status, receipt and accrual of income, connotation of income deemed to accrue or arise in India, Tax Planning, Tax Evasion and Tax Management.

Income from salaries, Income from house property, Profits and Gains from business or Profession, Capital Gains and Income from other sources, Aggregation of income, Carry forward and set off of losses, Gross Total Income, Deductions under Chapter VI A, Total Income , Computation of Tax liability of individual assesses, Preparation of Income tax returns of Individual assesses, E - filing of returns.

Computation of total income and tax liability of corporate entities with Minimum Alternate Tax, Corporate Dividend Tax, Exemptions available to companies in SEZ, Tax holidays, Tax implications of Corporate Restructuring, Double Taxation Avoidance Agreements (DTAA), Transfer pricing and General Anti Avoidance Rule (GAAR)

Income Tax authorities and functions, Deduction and collection of tax a source, advance tax and interest, return of income and assessment procedure, Refunds, penalties and prosecution, appeals and revision, Settlement of cases. Introduction to Indirect Taxes: Difference between direct and indirect taxes, Law relating to Central Excise, Customs, Service Tax, VAT and related rules, Introduction to GST.

Reference Books

1 Singhania, M., & Singhania, V. K. Students Guide to Income Tax, Singhania, M., & Singhania, V. K. (n.d.)., 2023, New Delhi:Taxmann Publications.

2 Corporate Tax Planning & Business TaxProcedures with Case Studies., Singhania, M., & Singhania, V. K. (n.d.)., 2023, New Delhi:Taxmann Publications.

3 Systematic Approach to Tax Laws &Practice, Ahuja, G., & Gupta, R. , 2023, Bharat Law House Pvt. Ltd. .

4 Direct Tax Laws, Manoharan, T. N., & Hari, G. R. , 2023, Mumbai Snowhite Publications Pvt Ltd.

23AD01HF - MACHINE LEARNING FOR HEALTHCARE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD01HF	MACHINE LEARNING FOR HEALTHCARE	MLH	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand fundamental machine learning concepts and their applications in healthcare.	2	PO1, PO2, PO3, PSO3
CO2	Apply data preprocessing techniques on healthcare data.	3	PO1, PO2, PO3, PSO3
CO3	Build supervised, unsupervised and deep learning models in healthcare context.	3	PO1, PO2, PO3, PSO3
CO4	Examine the challenges and ethical consideration in deploying machine learning models in healthcare.	4	PO1, PO2, PO3, PSO3
CO5	Evaluate various Machine Learning Techniques in health care domain using python language	5	PO1, PO2, PO3, PSO3

Syllabus

Introduction to Machine Learning in Healthcare:Overview of machine learning concepts: supervised learning, unsupervised learning, and deep learning. Introduction to healthcare applications of machine learning: predictive modeling, image analysis, natural language processing. Challenges and opportunities in applying machine learning to healthcare data.

Data Preprocessing Techniques for Healthcare Data: Data preprocessing for healthcare data - Handling missing values and outliers, Normalization and standardization techniques, Feature selection and dimensionality reduction. Techniques for dealing with imbalanced datasets in healthcare.

Machine Learning Algorithms for Healthcare:Supervised Learning Models - Linear Regression and Logistic Regression for disease prediction and outcome modeling, Support Vector Machines (SVMs) for medical image classification and diagnostic decision support, Decision Trees and Random Forests for hospital readmission prediction and personalized medicine. Unsupervised Learning Models - K-Means and hierarchical clustering for patient stratification and cohort discovery, Principal Component Analysis (PCA) and t-SNE for dimensionality reduction and visualization of healthcare data. Deep Learning Models - Convolutional Neural Networks (CNNs) for medical image analysis (e.g., radiology, pathology), Recurrent Neural Networks (RNNs) and LSTM networks for time series analysis in healthcare monitoring.

Challenges and Ethical Considerations in Deploying ML Models in Healthcare: Regulatory frameworks and compliance issues in healthcare data management - HIPAA, GDPR, Privacy and security challenges in handling sensitive patient data, Bias and fairness considerations in machine learning models - mitigating healthcare disparities, Ethical implications of AI and machine learning in clinical decision-making and patient care.

Reference Books

1 Machine Learning in Healthcare Informatics, Chee-Yee Chong, Sumeet Dua, 2014, CRC Press.

2 Machine Learning and Healthcare Analytics, Natarajan Meghanathan, Subarna Chatterjee, Hari Kalva, 2019, Springer.

3 Machine Learning for Healthcare: Technologies, Algorithms, and Applications, Carol Friedman, et al., 2020, O'Reilly Media.

4 Machine Learning for Healthcare: Case Studies and Algorithms for Working with Data, Manuel Amunategui, Adam Perer, 2021, O'Reilly Media.

23AD02HF - DATA ENGINEERING AND ARCHITECTURE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD02HF	DATA ENGINEERING AND ARCHITECTURE	DEA	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Comprehend the foundational concepts and components of data infrastructure, including databases, data warehouses, data lakes, and streaming platforms.	2	PO1, PO5, PSO3
CO2	Design and implement efficient data models for storage and processing, focusing on scalability, performance, and data integrity.	3	PO1, PSO1
CO3	Utilize various data storage technologies and data modeling techniques to manage and organize data effectively	3	PO1, PO5, PSO3
CO4	Familiar with the foundational concepts of data engineering and architecture to design and implement robust data systems.	2	PO2, PSO1
CO5	Implement data governance and security measures to ensure data integrity and compliance with regulations	3	PO2, PO5

Syllabus

Introduction to Data Engineering and Architecture: Overview of Data Engineering and Architecture, Key concepts, Data Lifecycle Management, Introduction to Data Modeling, Data Engineering Tools and Technologies

Data Storage Technologies: Relational Databases and SQL, NoSQL Databases: MongoDB, Cassandra, Data Warehousing and OLAP, Distributed File Systems: HDFS, AWS S3, In-Memory Databases: Redis, Memcached

Data Processing and Transformation: Batch Processing with Apache Hadoop, Stream Processing with Apache Kafka, Data Transformation with Apache Spark, Workflow Management: Apache Airflow, Real-time Data Processing: Apache Flink

Data Integration and ETL: Extract, Transform, Load (ETL) Processes, Data Integration Patterns and Architectures, Data Quality and Cleansing Techniques, Change Data Capture (CDC) Methods, ETL Automation and Orchestration

Data Governance and Security: Introduction to Data Governance, Data Privacy Regulations and Compliance, Data Security Best Practices, Auditing and Monitoring Data Systems, Role-based Access Control (RBAC) and Encryption Techniques

Reference Books

1 Tapping into Unstructured Data: Integrating Unstructured Data and Textual Analytics into Business Intelligence, Bill Inmon, Anthony Nesavich, 2007, IBM Press.

2 Hadoop: The Definitive Guide, Tom White, 2009, O'Reilly Media.

3 Learning Spark: Lightning-Fast Big Data Analysis, Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, 2015, O'Reilly Media.

4 The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, Ralph Kimball, Margy Ross, 2013, Wiley.

23AD03HF - REINFORCEMENT LEARNING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD03HF	REINFORCEMENT LEARNING	RIL	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Discuss basic and advanced reinforcement learning techniques.	2	PO1, PO4, PO5, PSO1
CO2	Demonstrate suitable learning tasks to which these learning techniques can be applied.	3	PO2, PO4, PO5, PSO1
CO3	Analyze some of the current limitations of reinforcement learning techniques.	4	PO2, PO4, PO5, PSO2
CO4	Formulate decision problems, set up and run computational experiments, evaluation of results from experiments.	5	PO2, PO4, PO5, PSO2
CO5	Design experiments to evaluate the performance of different reinforcement learning algorithms on various environments.	5	PO2, PO4, PO5, PSO3

Syllabus

Reinforcement learning framework, Bandit problems,Advanced Bandit Algorithms,action selection,Policy Gradient Methods

Dynamic programming,Markov Decision Processes (MDPs),Monte Carlo methods , Monte Carlo Control,Temporal-difference learning,Temporal-Difference Control

Planning in RL,Model-Based Planning Methods, Function approximation for generalization ,Advanced Function Approximation Techniques,Actor-critic and gradient-based optimization

Multi-agent reinforcement learning, Multi-Agent Learning Paradigms,Value-Based Methods in MARL,Environments with partial observability, Value-Based Methods for POMDPs

Reference Books

1 Reinforcement Learning: An Introduction, Richard S. Sutton and Andrew G. Barto, Second Edition,2018, The MIT Press.

2 Algorithms for Reinforcement Learning, Csaba Szepesv?ri, First Edition,2010, Morgan & Claypool Publishers.

3 Reinforcement Learning and Optimal Control, Dimitri P. Bertsekas and John N. Tsitsiklis, Second Edition,2019., Athena Scientific.

4 Reinforcement Learning: State-of-the-Art, Marco Wiering and Martijn van Otterlo (Editors), First Edition,2012, Springer.

23AD04HF - EXPLAINABLE AI (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD04HF	EXPLAINABLE AI	EAI	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the knowledge about AI basics and its diverse applications in various domains.	2	PO1, PO2, PSO1
CO2	Analyze the effects of AI technologies on society and consider ethical implications in their development and deployment.	4	PO1, PO2, PSO1
CO3	Explore the methods to interpret and explain AI models, focusing on their transparency and interpretability.	4	PO1, PO2, PSO1
CO4	Analyze different techniques to make AI models interpretable and understandable, ensuring transparency in their functioning.	4	PO1, PO2, PSO1
CO5	Design AI systems with built-in explainability features, ensuring they are suitable for real-world deployment and addressing societal concerns.	5	PO1, PO2, PSO1

Syllabus

Introduction to Explainable AI: Introduction to AI and its subfields Importance of explainability in AI systems; Ethical considerations in AI development Case studies on the societal impact of AI technologies; Interpretable machine learning techniques Model-agnostic explanation methods

Explainability Techniques and Methods: Local and global explanation methods, Perturbation-based explanation techniques, Incorporating explainability into AI development lifecycle, Case studies and projects on building explainable AI systems

Evaluation and Validation of Explainable AI Systems: Evaluate the effectiveness and limitations of explainable AI techniques: Metrics for evaluating explanation quality, Challenges and trade-offs in designing explainable AI systems; Validate the reliability and trustworthiness of explainable AI models: Verification and validation techniques for explainable AI, Ethical considerations in deploying explainable AI systems.

Advanced Topics in Explainable AI: Explore advanced topics and emerging trends in explainable AI: Adversarial attacks and defenses in explainable AI, Incorporating domain knowledge into explanation generation; Engage in research and innovation to enhance the explainability of AI systems: Research papers and current developments in explainable AI, Project work on advancing the state-of-the-art in explainable AI.

Reference Books

1. Interpretable Machine Learning: A Guide for Making Black Box Models Explainable, Christoph Molnar, First Edition, Leanpub.
2. Explainable AI: Interpreting, Explaining and Visualizing Deep Learning, Monika Wolinska and Wojciech Samek, First Edition, Springer.
3. Explainable AI: A Guide for Understanding, Visualizing, and Interpreting Deep Learning, Martin Wattenberg, Been Kim, and Fernanda Viegas, First Edition, CRC Press.
4. Interpretable AI: Machine Learning Insights for Practitioners, Dennis Rothman and Alexander Hentschel, First Edition, O'Reilly Media.
5. Evaluating Machine Learning Models: A Beginner, Christoph Molnar, First Edition, Leanpub.
6. Building Explainable AI Models: A Hands-On Guide for Data Scientists and AI Practitioners, Hima Patel and Hanlin Tang, First Edition, Packt Publishing.

7 Explainable AI: Understanding, Visualizing, and Interpreting Deep Learning Models, Przemyslaw Biecek and Tomasz Burzykowski, First Edition, Apress.

8 Interpretable Machine Learning with Python: Explaining Black Box Models with LIME, SHAP, and XAI, Serg Masis and Patrick Hall, First Edition, O'Reilly Media.

23AD2103R - SYSTEM DESIGN & INTRODUCTION TO CLOUD (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD2103R	SYSTEM DESIGN & INTRODUCTION TO CLOUD	SDC	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the functionalities and types of operating systems, their support for computer architecture, and concepts such as process virtualization, CPU scheduling, segmentation, paging, TLB, swapping, demand paging, thrashing, and page replacement algorithms	2	PO1, PO2, PO3, PSO2
CO2	Applying deadlock management strategies such as prevention, detection, and avoidance, alongside concurrency concepts including threads and common problems, while comparing network types, topologies, and reference models	3	PO1, PO2, PO4, PSO2
CO3	Understanding the network layer design issues, including store and forward packet switching, the services provided to the transport layer, and the implementation of connectionless and connection-oriented services	2	PO1, PO3, PO4, PSO2
CO4	Analyzing the fundamentals of cloud computing, including its history, characteristics, advantages and disadvantages, deployment models, cloud services (IAAS, PAAS, SAAS), virtualization, containers and pricing models	4	PO1, PO2, PO3, PSO2
CO5	Applying Operating System Concepts, HTTP Clients, HTTP Servers and Computer Networking concepts. Analyzing Cloud Service Providers - AWS EC2	3	PO1, PO2, PO3, PSO2

Syllabus

Operating System Functionalities, Types of Operating Systems, Computer Architecture support to Operating Systems, Process Virtualization: Processes, Process API code, Direct Execution, CPU Scheduling, Segmentation, Introduction to Paging, Translation Look Aside Buffer, Swapping, Demand Paging, Thrashing, Page replacement algorithms

Deadlock: Prevention, Detection and Avoidance Persistence, Concurrency: Concurrency and Threads code, Thread API, Common concurrency problems. Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Physical layer, Datalink layer

The Network Layer Design Issues - store and forward packet switching - Services provided to the transport layer - Implementation of Connectionless Service and Connection orientation service - Comparison of Virtual Circuit and Datagram Networks, Transport layer, Application layer

Fundamentals of Cloud computing : Cloud Computing Basics - History of Cloud Computing, Characteristics of Cloud Computing, Advantages and Disadvantages of Cloud computing,. Cloud deployment models, Introduction to Cloud services-IAAS,PAAS, SAAS, Overview, Virtualization, Container, Pricing models, SLA, VPC.

Reference Books

1 Principles of Operating System, Cesar Herrera, Flor Narciso , Darrell W Hajek, 2020, Independently published.

2 Operating system concepts essentials, Silberschatz, A., Galvin, P.B. and Gagne, G.,, 2018, John Wiley & Sons, Inc..

3 Cloud Computing A Complete Guide, Gerardus Blokdyk , 2020, Pearson.

4 Computer Networks: A Systems Approach, Larry L. Peterson, Bruce S. Davie , 2021, Morgan Kaufmann .

23AD2205R - DEEP LEARNING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD2205R	DEEP LEARNING	DL	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand and apply optimization algorithms to solve neural networks, enhancing model performance through weight adjustment. Develop the ability to select and implement appropriate optimization techniques for various neural network architectures and problems	3	PO1, PO2, PSO1
CO2	Apply CNN models and their variants to real-time data, including LeNet, AlexNet, ZF-Net, and VGGNet. Gain proficiency in implementing and optimizing these models for various real-time data scenarios.	3	PO1, PO2, PSO1
CO3	Apply RNN, Long Short Term Memory (LSTM), and autoencoders to relevant data tasks. Acquire the ability to design, train, and optimize these models for various sequential and feature extraction problems.	3	PO1, PO2, PSO1
CO4	Apply variational autoencoders and generative neural models for data generation tasks. Develop skills in constructing, training, and optimizing these models to create high-quality synthetic data.	3	PO2, PO3, PSO2
CO5	Apply and implement basic neural networks, various types of autoencoders, batch normalization, and convolutional neural networks. Gain proficiency in constructing, training, and optimizing these models for diverse applications. Develop the ability to enhance model performance using advanced techniques.	3	PO2, PO3, PSO2
CO6	Construct , Design and develop various types of neural network models, autoencoders, batch normalization, and convolutional neural networks. Gain expertise in building, training, and optimizing these models for different tasks. Enhance your ability to implement advanced techniques to improve model performance.	5	PO2, PO3, PSO2

Syllabus

Introduction to Deep learning, History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptron\\ , Introduction to Deep learning, History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptron\\ Bias Variance Tradeoff, L2 regularization, Early stopping, . Batch Normalization, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Dropout,

Greedy Layer wise Pre-training, etter activation functions, better weight initialization methods, Learning Vectorial Representations of Words Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet Object Detection RCNN, Fast RCNN, Faster RCNN, YOLO. Visualizing Convolutional Neural Networks, Guided Backpropagation,

Deep Dream, Deep Art, Recurrent Neural Networks, Backpropagation Through Time (BPTT),Vanishing and Exploding Gradients, Loss Functions in RNNs, Sequence Prediction, Gated Recurrent Units (GRUs), Long Short TermMemory (LSTM) Cells, Solving the vanishing gradient problem with LSTMs , Encoder Decoder Models:Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders.

Attention Mechanism, Attention over images, Deep Belief networks, Markov Networks. Restricted Boltzmann Machines, Unsupervised Learning, Motivation for Sampling, Markov Chains, Gibbs Sampling for training RBMs, Contrastive Divergence for training RBMs, Variational autoencoders, Autoregressive Models:NADE, MADE, PixelRNN , Generative Adversarial Networks (GANs) Cycle GAN ,Super resolution and Conditional GAN models, Deep Reinforcement learning

Reference Books

1 Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courvill, 2016, MIT Press.

2 Grokking Deep Learning, Andrew Trask, 2019, Manning publications.

3 Deep Learning with Python,, Francois Chollet,, 2018, Manning publications,.

4 Deep Learning: A Practitioner's Approach, Adam Gibson and Josh Patterson, 2023, O'Reilly Media.

23AD3207R - NATURAL LANGUAGE PROCESSING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD3207R	NATURAL LANGUAGE PROCESSING	NLP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply various approaches to syntax and semantics in NLP	3	PO1, PO6, PSO1
CO2	Apply the statistical estimation and statistical alignment models for language modelling and parsing.	3	PO1, PO6, PSO2
CO3	Apply Vector models for documents to gain insights of the document.	3	PO1, PO3, PSO3
CO4	Apply various statistical models for classification, information extraction, translation, and generation.	3	PO1, PO3, PSO2
CO5	Inspect and Evaluate Language Processing Methods using python	4	PO1, PO9, PSO1

Syllabus

Introduction to language processing: tokens, sentences, paragraphs, Sentence and Paragraph Segmentation, Introduction to Text Normalization (lowercasing, stemming, lemmatization, Corpora and their construction: representativeness, Regular expressions, extraction of information using Regex, Named Entity Recognition, Rule-Based Approaches for NER, Advanced smoothing for language modelling, POS tagging, Introduction to Hidden Markov Models

Models for Sequential tagging: MaxEnt, Viterbi Algorithm, CRF, Spelling Correction, Language Modelling , Computational Semantics, Lexical semantics: WordNet and FrameNet, Syntax: Constituency Parsing, Probabilistic Context-Free Grammars (PCFGs),Dependency Parsing: Dependency Trees, Transition-Based Parsing Comparison of Constituency and Dependency Parsing

Vector Space Model word vectors, GloVe,Word2Vec model, word embedding, Document Similarity measures Cosine and cluster measures, Text Classification, Clustering, and Summarization

Information Extraction, Document Classification, Clustering, topic modelling techniques, Machine Translation, Language Generation

Reference Books

1 Speech and Language PRocessing, Daniel Jurafsky and James H. Martin , 2023, MIT Press .

2 Natural language processing and Information Retrieval, U.S. Tiwary & Tanveer Siddiqui, 2020, Oxford University Press.

3 Natural language processing: A Paninian perspective , Bharati Akshar, Chaitanya Vineet, Sangal, Rajeev , 2002, PHI .

4 Foundations of Statistical Natural Language Processing , l. Manning, Christopher D.; HinrichSchuetze; , 1999, MIT Press.

23AD4108 - ETHICS FOR ARTIFICIAL INTELLIGENCE (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23AD4108	ETHICS FOR ARTIFICIAL INTELLIGENCE	EAI	R	1	0	0	0	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Ethical Principles underlying AI development and deployment, including transparency, fairness, accountability, and privacy.	2	PO3, PO5, PO8, PSO2
CO2	Analyze Ethical Dilemmas arising in AI design, development, and deployment, considering multiple perspectives and potential consequences.	4	PO3, PO5, PO8, PSO2
CO3	Apply Ethical Frameworks and guidelines to evaluate the ethical implications of AI technologies across various domains such as healthcare, employment, and social justice.	3	PO3, PO5, PO8, PSO2
CO4	Critically Evaluate AI Systems for biases, fairness, and ethical considerations, employing analytical tools and methods to assess the ethical soundness of these systems.	5	PO3, PO5, PO8, PSO2

Syllabus

Introduction to Ethics and AI: Overview of ethical theories, Introduction to AI and its ethical implications, Ethical frameworks for AI development Ethical Principles in AI: Ethical principles: transparency, fairness, accountability, and privacy, Case studies on ethical principles in AI applications Bias and Fairness: Understanding bias in AI systems, Fairness in algorithmic decision-making, Strategies for mitigating bias in AI

Privacy and Data Ethics: Privacy issues in AI, Data ethics and responsible data use, GDPR and other regulatory frameworks Autonomous Systems and Responsibility: Moral agency in AI, Responsibility and liability in autonomous systems, Case studies on ethical decision-making by autonomous systems Ethical Design and Development: Ethical considerations in AI design, Participatory design and stakeholder engagement, Ethical guidelines and best practices

AI and Employment: Impact of AI on employment and the workforce, Ethical considerations in AI-driven automation, Policies and interventions to address job displacement AI and Healthcare: Ethical issues in AI-enabled healthcare, Bias in medical AI algorithms, Patient privacy and consent in AI-driven healthcare systems AI and Social Justice, AI ethics and social justice, Ethical implications of AI in criminal justice, education, and other domains, Addressing bias and promoting equity in AI applications

Ethical Governance and Regulation: Regulatory challenges in AI, International efforts for AI governance, Ethical considerations in AI policy-making Ethical Decision-Making in AI: Ethical decision-making frameworks, Case studies on ethical dilemmas in AI, Ethical impact assessments Future Directions and Emerging Ethical Challenges: Emerging ethical challenges in AI: Ethical considerations in advanced AI technologies (e.g., AGI): Ethical leadership in AI development and deployment

Reference Books

1 Philosophy and Theory of Artificial Intelligence, Vincent C. M?ller, 2017, Springer.

2 Robot Ethics: The Ethical and Social Implications of Robotics (Intelligent Robotics and Autonomous Agents series), George A. Bekey, Keith Abney, Patrick Lin, 2014, The MIT Press, Cambridge, London.

3 Artificial Intelligence: A Guide for Thinking Humans, Melanie Mitchell, 2019, Farrar, Straus and Giroux.

4 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING, Dr G.Revathy, Dr S.Selvi, Dr N.S.Kavitha, 2023, MJP Publishers.

23BT1101 - CELL BIOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT1101	CELL BIOLOGY	CB	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the stuructural organization of cell and apply theknowledge of genomic organization in designing primers	3	PO1
CO2	Apply the knowledge on cell cycle in identifying drug tagetsinvoled in various disease condition	3	PO1
CO3	Apply the knowledge of receptor signalling and list thetherapeutic molecules which can interfere with receptorsignalling pathways and inhibit cancer cell growth	3	PO4
CO4	Apply the knowledge of cell membrane organization andcellular transport mechanism in liposome assited drug delivery	3	PO1, PO4

Syllabus

Structure and function of Prokaryotic and Eukaryotic cell bacterial cell, plantcell,animal cell, Cyanobacterial cell. Cell organelles

Cell division and cell cycle-Cell Division: Mitosis and Meiosis. Steps in cell cycle, Go-G1 transition, cell cycle checkpoints,Chromosome movements, regulation of cell division. Cell differentiation: cortical Differentiation,nucleardifferentiation and cell death

Tissues & Receptors Meristems, Simple, complex and specialtissues.Growth patterns, Cell growth and mechanisms. Embryonicdevelopment, Organogenesis,metamorphosis,Cell signaling Membrane receptors, Cell Cell interactions

Membrane Structure andTransport Thestructural and functional organization of cell membrane, the extra cellular matrix of eukaryotes cell wall.Transport across cell membrane passive and active transport, NaK pump, Ca2+ATPase pumps,Lysosomal and Vacuolar membrane ATP dependent proton pumps, Co-transport intoprokaryotic cells,endocytosis, exocytosis, pinocytosis and phagocytosis

Reference Books

1 Cell biology, Genetic, Molecular Biology, Evolution and Ecology, P.S. Verma and V.K. Agarwal,, 2004 , S. Chand and Company Ltd..

2 Schaum's Outline of Biology, George H fried,, 2013 , McGraw Hill..

3 Cell Biology & Molecular Biology, EDP Roberties & EMF Roberties, 2017, Wolters Kluwer Publishers.

4 Textbook of Biochemistry and Human biology, G P Talwar and L.M. Srivatsava, 2002, PHI Learning.

23BT2103R - BIOCHEMISTRY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT2103R	BIOCHEMISTRY	BCM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Relate the importance of biological buffers and its preparation,explain cellular thermodynamics, structure, function andmetabolism of carbohydrates; the association between structureand function of carbohydrate at a chemical level with a biologicalperspective with a hands-on approach on laboratory techniques	2	PO1, PO2, PO4, PSO1
CO2	Make use of the information about the folding, conformation, dynamics and intrinsicproperties of proteins and apply the knowledge to learnt aboutabnormalities related with protein dysfunction and their clinicalimportance	3	PO1, PO2, PO4, PSO1
CO3	Apply the structural and biological roles that nucleic acids andlipids play in cellular physiology, and application of thatknowledge in biotechniques to identify these biomolecules anddiscuss about disorders related with nucleotide metabolism	3	PO1, PO2, PO4, PSO1
CO4	Categorize enzymes, catalysis, kinetics, applications; immobilizedenzymes and their catalytic mechanisms	4	PO1, PO2, PO4, PSO1
CO5	Analyze the biomolecules from various sources by employing experimental techniques and laboratory studies	4	PO1, PO2, PO4, PSO1

Syllabus

Types of the chemical bonds in biomolecules, Principles of biophysical chemistry pH, buffer,Henderson-Hasselbalch equation, colligative properties of solution. Composition, structure, and function ofcarbohydrates: monosaccharides, disaccharides and polysaccharides (homopolysaccharides andheteropolysaccharides). Ring structure and mutarotation, stereo isomers and optical isomers, disorder ofcarbohydrate metabolism. Principle of bioenergetics and introduction to cellular thermodynamics, Gibbs freeenergy, Enthalpy, Entropy, Concept of free energy, and standard free energy change, Biological oxidation-reduction reactions, Glycolysis & oxidation of Pyruvate, Krebs (TCA) cycle, its function in energy generation,Role of vitamin and Inhibitors of TCA cycle, Pentose phosphate pathway, Gluconeogenesis, electron transportand Oxidative phosphorylation, Inhibitors of ETC cycle.

Amino acids and Metabolism: Classification andCharacteristics, Zwitter ion, isoelectric pH of amino acids, Amino acid biosynthetic pathway; Amino acidbiodegradation: Deamination, transamination, Urea Cycle, Blood urea clinical importance, Amino acid asneurotransmitter. Peptide & Protein: peptide bond and pI values of peptides, solid-phase peptide synthesis,Ramachandran plot, structural organization of proteins, protein stability and folding, native structure of protein(Myoglobin, Hemoglobin and collagen), conjugated proteins, Abnormalities associated with Hemoglobin.

Lipids: Fats and lipids Introduction, Essential fatty acids. Fatty acid synthesis. beta oxidation of fatty acids. Nucleic acids Synthesis of Purines, Pyrimidines. Catabolism of purine and pyrimidine nucleotides.

Enzymes:nomenclature and classification of enzymes, enzyme kinetics (Michaelis-Menten and Lineweaver-Burk plot),influencing elements for enzyme activity, cofactor, coenzymes and allosteric modulators, enzyme inhibitionand types, Immobilization of enzymes.

employing experimental techniques and laboratory studies

Reference Books

1 Harper's Illustrated Biochemistry, Murray RK, Granner DK, Mayes PA, Rodwell VW, 2022, McGraw-Hill Publishers.

2 Lehninger Principles of Biochemistry, Nelson DL, Cox MM, HoskinsAA, 2021, Macmillan Publishing.

3 Biochemistry, Satyanarayana U, Chakrapani U, 2020, Elsevier Publishing.

4 Essentials of Biochemistry, Naik P , 2022, Jaypee Brothers Medical Publishers.

23BT2104 - MICROBIOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT2104	MICROBIOLOGY	MBG	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the history of Microbiology, taxonomy, working principles, and the importance of various microscopes in the analysis of physicochemical properties of microorganisms.	2	PO1
CO2	Understand the structure and biology of microorganisms and apply the staining techniques to visualize the structures.	3	PO1
CO3	Analyze and determine the growth, in vitro culturing, physicochemical properties, and controlling of microorganisms, and the various means to control the microorganisms and enumerate them.	3	PO1
CO4	Analyze the various diseases caused by bacteria, Fungi, and Viruses. Design, conduct experiments, and interpret the data pertaining to the biochemical and metabolic potential of microorganisms.	3	PO1
CO5	Formulate various sterilization, isolation, culturing techniques for microbes	3	PO1

Syllabus

Major contributors in the field of Microbiology - Antony van Leeuwenhoek; Robert Koch- Germ theory of disease and Koch postulates; Louis Pasteur, Edward Jenner; Joseph Lister; Winogradsky and Beijerinck. Discovery of microorganisms; Taxonomy-Major characteristics used in taxonomy, types of taxonomy (Phylogenetic, phenetic, numerical), Microbial taxonomy and diversity: Classification of microorganisms, Bacteria, and their broad classification., Bergey\'s Manual of bacteriology, Light microscopy-Bright field and dark field microscopy; simple compound, fluorescence, and electron microscopy.

MORPHOLOGY AND CELL STRUCTURE OF MICROORGANISMS Ultrastructure of bacteria cell wall, external appendages, endospore, and cell inclusions. Identification based on shape, simple, differential, capsule, Endospore, Acid-fast staining, Yeasts and Molds, Classification of Fungi, morphology, life cycle. Morphology and classification replication of viruses, lytic and lysogenic cycles.

Nutritional classification of bacteria, Essential Macronutrients, Micronutrients, and Growth factors. Microbial growth, Growth curve and factors affecting the growth. Culture media, synthetic and complex media, solidifying agents, types of media. Synchronous growth and diauxic growth, Isolation of pure cultures, spread, pour, and streak plate methods. Maintenance and Preservation of microorganisms, Methods of growth estimation. Classification of Archaebacteria, thermophiles, psychrophiles, halophiles, and methanogens. Sterilization and disinfection, Antibiotics, classification, mode of action, and resistance.

Normal microbial flora, Respiratory infections caused by bacteria and viruses, Influenza, Tuberculosis, Hepatitis, Disease transmitted by animals, rabies and insects malaria, Food and water-borne diseases, Typhoid, pathogenic fungi, Viroids, Virusoids and Prions

Reference Books

1 Microbiology , Pelczar MJ, Chan ECS & Krieg NR , 5, 2023, Tata McGraw Hill .

2 General Microbiology , Prescott & Dunn , 11, 2019, McGraw Hill publishers .

3 Textbook of Microbiology , Arora, 5, 2017, CBS Publishers and Distributors .

4 Medical Microbiology , Ananthanarayan and Panikar , 12, 2022, Orient Blackswan .

23BT2105R - IMMUNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT2105R	IMMUNOLOGY	IMM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the role and components of immune system	3	PO2, PO3, PSO2
CO2	Apply the mechanism of immune system in Healthcare Biotechnology	3	PO2, PO3, PSO2
CO3	Apply the role of T Cells and B Cells in Immunity and to Apply the concepts of immune system to disease/disorders	3	PO3, PO6
CO4	Apply the concept of immunology to diagnostics	3	PO6, PO7
CO5	Conduct experiments based on concepts of immunity	3	PO6, PO7

Syllabus

Types of Immunity, Innate, acquired, Humoral & cell mediated; Organs of the immune system: Primary lymphoid organs Bursa of fabraceous, Bone marrow, thymus; Secondary lymphoid organs Spleen, lymph node.Cells of immunity, Lymphoid & Myeloid lineage

Antigens Types, Chemical nature of antigens, characteristics of Antigen, Hapten and Cytokines; Types, receptors and functions, B Cell Ontogeny, B-Cell biology, BCR

Immune Response, Primary, Secondary, and Tertiary Reponses, Theories of Immune Response, Immunoglobulins Strcture, Types, Subtypes, and Role, T Cell Ontogeny, T Cell Biology, TCR , TYpes of T Cells, TH.TC, and TS Cells, T Cell Effector Mechanism, Strcture of MHC I and II, Mechanism of Antigen Processing, Antigen Presentatin, Professional Antigen Presenting Cells, Clinical Immunology

Complement System-Classical, alternative, and MB Lectin Pathway & Regulation, Hypersensitivity: IgE Mediated, Antibody Dependent Cell Cytotoxicity, Immune Complex mediated reactions and delayed type of hypersensitivity, Autoimmunity-systemic & organ specific, Transplantation immunity-MLR and MCA, Tumor Immunity, Tumor Antigens, Vaccination-Basic Concept and Types

ODD Assay (Ag-Ab Pattern), ODD Assay (Ab Titre), Immunoelectrophoresis, Counter current immunoelectrophoresis, Radial Immunodiffusion, Rocket Immunoelectrophoresis, Dot ELISA, Antigen capture ELISA, Western Blot, Purification of IgY, Antibody capture ELISA, Antibody capture ELISA, Antibody HRP conjugation.

Reference Books

1 Kuby Immunology, Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen, 2018, WH Freeman .

2 Elements of Immunology, Fahim Halim Khan , 2009, Pearson .

3 Roitts Essential Immunology, Ivan Roitt, 2001, Wiley.

4 Practical Immunology, Frank C. Hay, Olwyn M. R. Westwood, 2002, AP.

23BT2206 - MOLECULAR BIOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT2206	MOLECULAR BIOLOGY	MBY	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the DNA structure and genome organization	2	PO1
CO2	Understand the DNA replication in prokaryotes and eukaryotes along with DNA damage and its repair mechanisms	2	PO1
CO3	Understand the mechanism of transcription and translation and apply the post-transcriptional and post-translational modifications along with cracking of genetic code	3	PO1
CO4	Applications of gene expression in prokaryotes and eukaryotes	3	PO1

Syllabus

Nucleic acid as genetic material, Genome of prokaryotes and eukaryotes, C Value Paradox, repetitive DNA, pseudogenes, split genes. Watson and Crick model, Forms of DNA. Transposons

Semi conservative replication apparatus, bidirectional and rolling circle replication. DNA damage, Mutations, Types of Mutations, Effect of UV, Deamination, Alkylation. Repair Mechanisms, Direct Repair, Excision Repair, Mismatch Repair, SOS Repair and Recombination Repair.

Mechanism of transcription and translation in Prokaryotes and Eukaryotes, Structure of Promoters, RNA Polymerases of Prokaryotic and Eukaryotic Organisms, Post Transcriptional Processes of Eukaryotic RNA, Translation in prokaryotic and Eukaryotes, Genetic code, Posttranslational modifications and protein synthesis. Gene Silencing.

Regulation of gene expression Regulation of Gene expression in Bacteria, Operon concept, inducible and repressible operons, positive and negative regulations, Inducer molecules, repressor molecules, co repressor molecules, Induction and catabolic repression of lac Operon in E.Coli, Repression and attenuation of trp operon in E.Coli, Absolute control by Antisense RNAs. Regulation in eukaryotes, Control by promoter, enhancer and silencers. Cis trans elements.

Reference Books

1 Molecular Biology, D Freifelder, 2015, Narosa Publications.

2 Molecular Biology of the Cell, Bruce Alberts, 2014, Garland Science .

3 Principles of Molecular Regulation, PM Conn, AR Means, 2011, Humana Publishers.

4 Cell And Molecular Biology , De Robertis, 2017, Walters Kluver.

23BT2215 - PROCESS ENGINEERING PRINCIPLES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT2215	PROCESS ENGINEERING PRINCIPLES	PEP	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the various methods for estimation of chemical composition of different microbial cultures	3	PO1, PO2, PSO1
CO2	Apply various techniques for determination of volatile components in the microbial cultures	3	PO1, PO2, PSO1
CO3	Apply the principles of material balance for designing of Bioreactors	3	PO1, PO2, PSO1
CO4	Apply various principles of Energy balance for designing of Stirred tank reactors.	3	PO1, PO2, PSO1
CO5	Apply the various processes to produce value added biological products from different sources.	3	PO1, PO2, PSO1

Syllabus

Introduction to Engineering Calculations: Physical variables; dimensions and Units; Measurement conventions: Density, specific gravity; specific volume, mole, chemical composition, vapour pressures, concentration, composition of mixtures and solutions: molarity, molality, normality, weight fractions, mole fractions,

Ideal gas law, differences between ideal and real gases, application of ideal gas law, Daltons law of additive pressures, amagat law of additive volumes, volume changes with change in composition

Material balances: Introduction to system and process; difference between steady state and equilibrium, Law of conservation of mass: Types of material balances, Procedure for material balance calculations with and without chemical reactions, Material balances in cell culture: Material balance for continuous filtration, batch mixing, material balances with recycle, by pass and purge streams

Energy balances: Basic Energy concepts: law of conservation of energy, standard heat of formation, latent heat of vaporization and condensation, specific heat, Energy balance worked examples without reaction: cooling in downstream processing, continuous water heater, and fermentation energy balance.

Reference Books

1 Bioprocess Engineering Principles, Pauline M.Doran,, 1995, ELSEVIER publications.

2 Introduction to Biochemical Engineering, D G Rao, 2005, Mc Graw Hill publications.

3 Bioprocess Engineering, Basic Concepts, Michael L.Shuler Fikret Kargi, 2001, Pearson Education India.

4 Introduction to Process calculations (Stoichiometry), K.A Gavhane, 2016, Nirali Publication.

23BT2224F - BIOREACTOR OPERATIONS (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT2224F	BIOREACTOR OPERATIONS	BO	F	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding various process parameters for designing of bioreactor.	2	PO1
CO2	Apply various unit operations for purification of value added products.	3	PO1, PO6
CO3	Apply various bioreactors for production of value added products from microorganisms and enzymes.	3	PO3, PO6
CO4	Interpret various Transport Processes for designing of bioreactor and unit operations.	3	PO3, PO6
CO5	Analyze the kinetics of biological system involved in fermentation processes to enhance productivity and biomass.	4	PO3

Syllabus

Overview of Biological Reactions, Types of Biological Reactions, Reaction Kinetics, Stoichiometry of Biological Reactions, Elements in Bioreactor Design, Bioreactor Types, Design Considerations, Instrumentation and Control Systems, Rate Expression in Biological Systems, Monod Equation, Enzyme Kinetics, Inhibition Kinetics, Basic Concept of Mass Transfer, Mass Transfer Mechanisms, Oxygen Transfer, Scale-Up Considerations, Basic Concept of Heat Transfer, Heat Transfer Mechanisms, Temperature Control, Heat Transfer in Bioprocesses

Development of Bioreactors, Historical evolution of bioreactor design, Fundamental design principles, Types of bioreactors: stirred-tank, airlift, packed bed, fluidized bed, Materials and construction considerations Purpose and Importance of Bioreactors, Optimization of growth conditions (pH, temperature, dissolved oxygen, nutrient supply), Scalability and production efficiency Bioreactor Development for Solid State Fermentation (SSF), Principles and advantages of SSF, Design considerations: substrate handling, moisture control, aeration strategies, Bioreactors for Animal Cell Cultivations, Unique requirements for animal cell cultures, Types of bioreactors: stirred-tank, wave, hollow-fiber, Scalability and production strategies, Regulatory and quality considerations Bioreactors for Immobilized Systems, Immobilization techniques: adsorption, covalent binding, entrapment, Design and operation of immobilized systems: packed bed, fluidized bed reactors, Bioreactors Used in Different Areas of Environmental Control and Management, Wastewater treatment: aerobic and anaerobic digesters, Bioremediation processes for soil and water, Biofiltration and air treatment: biofilters, bioscrubbers,

Scale-Up Methodologies for Bioreactors: Introduction to scale-up challenges, Criteria of scale-up: geometric, kinematic, and dynamic similarity, Similarity criteria: Reynolds, Froude, P?clet numbers, Scale-up methods: constant power input per unit volume, constant impeller tip speed, constant oxygen transfer rate, Generalized approaches to scale-up: computational fluid dynamics (CFD) simulations, integrative approaches combining multiple methods, Case studies in scale-up: industrial examples, challenges, solutions. Scale-Down Methodologies for Bioreactors: Introduction to scale-down challenges, Scale-down techniques: miniaturization of bioreactors, microfluidic systems, high-throughput screening platforms, Simulating large-scale conditions in small-scale systems, Application of scale-down models: case studies, process optimization, troubleshooting. Gas-Liquid and Liquid-Liquid Mass Transfer in Bioreactors: Fundamentals of mass transfer: mass transfer coefficients, interfacial area, diffusion rates, Factors affecting mass transfer: agitation speed, aeration rate, temperature, reactor geometry, Enhancing mass transfer: spargers, baffles, impellers, Modeling mass transfer: mathematical models, CFD simulations, Measurement techniques: oxygen uptake rate (OUR), carbon dioxide evolution rate (CER), tracer studies, Case studies in mass transfer: strategies, real-world examples, process performance improvements.

Design-of-Experiments for Development and Optimization of Bioreactor Media, Fundamentals of Design-of-Experiments (DoE), Evaluation of Experimental Design, Optimization of Culture Media by Design-of-Experiments, Integration with Computational Modeling, Artificial Liver Bioreactor Design, Principles of Artificial Liver Support Systems, Bioreactor Design Considerations, Clinical Applications and Challenges, Bioreactors Enabling Cell Production for Transplantation, Cell Culture Bioreactors, Stem Cell Bioreactors, Tissue Engineering Bioreactors.

Reference Books

1 Bioreactors Design, Operation and Novel Applications, Carl Fredrick, 2016, Wiley.

2 Bioprocess Engineering Principles, Pauline M. Doran, 2012, Academic Press.

3 Bioreactor System Design, Juan A. Asenjo, Jose C. Merchuk, 1994, CRC Press.

4 Principles of Fermentation Technology, Peter F. Stanbury, Allan Whitaker, Stephen J. Hall, 2016, Butterworth-Heinemann.

23BT3213R - DOWNSTREAM PROCESSING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT3213R	DOWNSTREAM PROCESSING	DSP	R	2	0	4	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply basics of primary separation and recovery processes of various biomolecules	3	PO1
CO2	Applying the principles of suspended solids removal and product enrichment operations	3	PO1
CO3	Apply the aqueous two-phase extraction process and other product purification methods	3	PO2, PO3, PO7
CO4	Analyse the methods for alternative separation, product polishing and formulation studies.	3	PO2, PO3, PO7
CO5	Analyze various bioseparation methods for recovery, isolation and purification of various bioproducts	4	PO3, PO7

Syllabus

Downstream Processing in Biotechnology Introduction; overview of bioseparation; characterization of Biomolecules, characterization of fermentation broth: Morphology of cells, structure of the cell wall, product concentrations, Biomass density. Primary separation and Recovery Processes: Recovery of intracellular products: Cell disruption methods physical methods (osmotic shock, grinding with abrasives, solid shear, liquid shear) , chemical methods (alkali, detergents) enzymatic methods.

Removal of suspended solids: filtration, filtration equipment, centrifugation, centrifugation equipment tubular bowl, disk-stack, basket centrifuges. Membrane based separations classification & characteristics of membrane separation, merits & demerits. Microfiltration, ultrafiltration, reverse osmosis, dialysis & electro dialysis, Membrane modules: Plate & Frame, hollow fiber, spiral wound, shell & tube.

Product Enrichment Operations: Aqueous two phase extraction process, Applications of aqueous two phase extraction, reversed micelles extraction principle, micelle structures, critical micelle concentration, limitations of reversed micelles, Protein solubilization precipitations of proteins with salts and organic solvents, kinetics of protein aggregation. Product Purification: Chromatographic separations: Classification of chromatographic techniques, Principles &practices of Gel Filtration, Ion Exchange and Affinity chromatography. Alternative separation methods and product polishing: Supercritical extraction: principles of SCE, Flow scheme of a simple SCE system.

Polishing: Crystallization, principles of crystallization and equipment, principles of drying and lyophilization, Freeze dryer. Formulation strategies: Importance of formulation, formulation of beakers yeast, Enzymes, formulation of pharmaceutical products.

Reference Books

1 Bioseparations- Principles and Techniques, B. Sivasankar, 2013, PHI Learning Pvt. Ltd.

2 Bioseparations Science and Engineering , Roger G. Harrison, Paul W. Todd, Scott R. Rudge, Demetri P. Petrides , 2015, Oxford University Press .

3 Principles of Downstream Processing , E. J. , 1995, Wiley.

4 Handbook of Downstream Processing, E Goldberg, 1996, Springer.

23BT3214 - BIOINFORMATICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23BT3214	BIOINFORMATICS	BI	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Acquire the theoretical basis of bioinformatics and understand the access and analyze the biological information from databases.	3	PO1, PSO1
CO2	Choose the DNA/Protein sequences using standalone PC programs and with the help of the worldwide web.	3	PO1, PO5, PSO1
CO3	Apply multiple sequence alignment tools on gene and protein sequences to find homologs, construct and interpret the evolutionary trees.	3	PO1, PSO1
CO4	Apply structural bioinformatis to understand the secondary and tertiary structures of proteins from primary sequence.	3	PO1, PO5, PSO1
CO5	Choose the sequences from the databases and apply sequence alignment, tree construction tools to infer their relations.	3	PO1, PO5, PSO1

Syllabus

Biological Information on the web. Introduction to Biological databases Primary Databases: NCBL, EMBL, DDBJ. Secondary Databases: SwissProt, PIR. Specialized data bases KEGG and BRENDA. Information retrieval from Databases. Concepts of Data mining, Basics of Sequencing Technologies, Genome projects human genome project.

SEQUENCE COMPARISONS AND ALIGNMENTS: String similarity Local, Global alignment; pair wise alignments Dot plots, Dynamic Programming Methods, Heuristic methods FASTA and BLAST; Amino acid substitution matrices- PAM and BLOSUM.

MULTIPLE SEQUENCE ALIGNMENT: Methods for Multiple sequence alignments- local and global multiple sequence alignment; Significance and applications of MSA, PHYLOGENETIC ANALYSIS: Origins of Molecular Phylogenetics; Methods of Phylogenetic analysis- Maximum Parsimony Maximum Likelihood and Distance based methods.

STRUCTURAL BIOINFORMATICS: Protein Structure Basics; Peptide Formation; Dihedral Angles; Hierarchy Secondary Structures, Tertiary Structures, Primary structural analysis and prediction, Secondary structural analysis and prediction.PERL programming basics.

Reference Books

1 Essential Bioinformatics , Jin Xiong , 2012, Cambridge University Press .

2 BIOINFORMATICS: METHODS AND APPLICATIONS GENOMICS, PROTEOMICS AND DRUG DISCOVERY , RASTOGI, S.C., RASTOGI, PARAG, MENDIRATTA, NAMITA , 2022, PHI Learning Pvt. Ltd .

3 BIOINFORMATICS , Vinay Sharma, Ashok Munjal, Ashish Shanker , 2019, Rastogi Publications .

4 Bioinformatics: Sequence, Structure, and Databanks: A Practical Approach, Des Higgins, Willie Taylor, 2000, Oxford University Press.

23CE2207 - CONCRETE TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE2207	CONCRETE TECHNOLOGY	CT	R	3	0	2	4	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand about the constituent and properties of cement	2	PO1
CO2	Understand about the fresh, hardened and durability of concrete.	2	PO1
CO3	Understand about special concretes and concreting techniques.	2	PO4
CO4	To apply concrete mix design in the field.	2	PO3, PSO1
CO5	Demonstrate and apply knowledge experiments in the project-based laboratory	3	PO6
CO6	Understand the production and placement of concrete	2	
CO7	Develop solutions for enhancing concrete performance	6	

Syllabus

Basics: Historical background, composition of concrete, general note on strength mechanism, recent practice and future trends. Constituent of Concrete : 1. Cement , Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, testing of cement as per Indian standard. 2. Aggregates , Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading and grading requirements, sampling & testing as per Indian Standards. 3. Water , General Requirements & limiting values of impurities. 4. Admixtures , Additives and admixtures, types, necessity and benefit Mineral admixture , Fly ash, silica fume, blast furnace slag, and other pozzolanic materials. Chemical admixtures , Accelerator, retarder, water reducing elements, plasticizer and super-plasticizer, their functions and dosage.

Fresh concrete , Methods of mixing, transporting and placing of concrete. Workability ,Definition and requirement, factors affecting workability, various tests as per IS and ASTM. Segregation and bleeding, stiffening, retempering. Curing, necessity and various methods, micro-cracking. Hardened concrete, Compressive and tensile strength and their relationship, various tests as per IS and ASTM. Factors affecting strength, water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Introduction to aspects of elasticity, shrinkage and creep. Tests for strength of concrete: Destructive, semi destructive and non destructive tests with their limitations, test methods as per IS and ASTM. Durability and permeability of concrete, Definitions, causes, carbonation, cracking

Concrete in aggressive environment: Alkali aggregate reaction, sulphate attack, chloride attack, acid attack, effect of sea water, special coating for water proofing, sulphate chloride and acid attack, concrete for hot liquids. Special Concrete: Review of behavior and characteristics of high strength concrete, high performance concrete, fiber reinforced concrete, mass concrete, light weight and heavy weight concrete, Precast concrete Special concreting techniques: Pumped concrete, concrete, underwater concrete, pre-placed concrete, vacuum dewatered concrete, hot and cold weather concreting, Ready mixed concrete.

Concrete mix design: Principles of mix proportioning, probabilistic parameters, factors governing selection of mix. Road note 4, DOE, ACI and IS method of concrete mix design, Variability of test results, acceptance criteria, various IS code provisions.

Testing of Concrete: Fresh Concrete Testing Slump test, flow test, Vebe test, compaction factor test. Hardened Concrete Testing: Compressive strength test, split tensile test, flexural strength test. Non-destructive testing methods: Rebound hammer, ultrasonic pulse velocity

Durability of Concrete: Chemical Attack on Concrete Sulfate attack, chloride attack, alkali-aggregate reaction Reinforcement Corrosion Mechanism of corrosion Factors affecting corrosion Prevention methods: Coatings, cathodic protection Environmental Impact Freeze-thaw cycles, carbonation, and abrasion resistance

Enhancing Concrete Performance: Use of Admixtures Water reducers, superplasticizers, accelerators, retarders Supplementary Cementitious Materials Fly ash, slag, silica fume, and their effects on concrete properties Advanced Curing Techniques Steam curing, membrane curing, and self-curing concrete

Production and Placement of Concrete: Batching and Mixing Batching methods: Weight batching, volume batching Types of mixers: Drum mixers, pan mixers, truck mixers Transportation and Placement Methods of transportation: Pumps, conveyors, cranes Placement techniques: Compaction, vibration, and finishing Curing of Concrete Importance of curing Methods of curing: Water curing, membrane curing, curing compounds

Reference Books

1 "Concrete Technology, A.M. Neville, 5th, Pearson.

2 Concrete Technology, M.S. Shetty , 7th, S. Chand & Company Ltd;.

3 Concrete: Microstructure, Properties, and Materials, P. Kumar Mehta and Paulo J.M. Monteiro, 4, McGraw-Hill Education.

4 Concrete Technology, A.R. Santhakumar, 1, Oxford University Press.

23CE3109 - ENVIRONMENTAL ENGINEERING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CE3109	ENVIRONMENTAL ENGINEERING	EVE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To Understand the demand of water and water treatment process	2	PO1, PO3, PO7, PSO3
CO2	Understand the concept of Water distribution system by using Equivalent pipe method	2	PO1, PO3, PO7, PSO3
CO3	To Design of sewerage system and septic tank design and sewage treatment process	3	PO1, PO3, PO7, PSO3
CO4	To design concept in construction landfill and elborate Solid Waste Management methods and Noise pollution effects	3	PO1, PO3, PO7, PSO3
CO5	Evaluate the Advanced waste water treatment and Industrial wastewater treatment	5	PO1, PO3, PO7, PSO3

Syllabus

Definition of water demand, Factors influencing water demand, Global and regional water demand trends, Types of Water Demand, Water Sources, Water Treatment Processes, Challenges in Water Treatment

Introduction to Water Distribution Systems, Definition and importance of water distribution systems, Components of a typical water distribution system , Factors influencing the design and operation of water distribution networks, Explanation of the Equivalent Pipe Method

Introduction to Sewerage Systems, Definition and significance of sewerage systems, Components of a sewerage system, Sewage Treatment Process, Design Considerations for Sewerage Systems,

Introduction to Construction Landfill, Design Overview of construction landfill, design principles, Factors influencing landfill, site selection, Engineering considerations in landfill construction, ,Solid Waste Management Methods in Construction, Types of solid waste generated in construction projects Best practices for waste minimization and recycling

Advanced Treatment Technologies, Membrane technologies: microfiltration, ultrafiltration, nanofiltration, and reverse osmosis, Adsorption techniques, Ion exchange, Design principles and operational considerations

Reference Books

1 Environmental Engineering: Fundamentals, Sustainability, Design, James R. Mihelcic, 2000, John Wiley & Sons.

2 Introduction to Environmental Engineering, Mackenzie L. Davis, 2006, McGraw-Hill Education.

3 Handbook of Environmental Engineering, Lawrence K Wang, 2015, Humana press.

4 Introduction to Environmental Engineering and Science, Gilbert M. Masters, Wendell P. Ela, 2014, Prentice Hall.

23CI2203 - MANAGEMENT INFORMATION SYSTEM - ERP (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23CI2203	MANAGEMENT INFORMATION SYSTEM - ERP	MIS	R	2	0	0	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Remember the basic concepts and technologies used in the field of management information systems from technical, socio-ethical and business perspective and as well for assessing the relationship between the digital firm, electronic commerce, electronic business and internet technology.	2	
CO2	To apply various knowledge representation methods with different technology infrastructure and business intelligence as strategic weapons to counter the risks associated with business and for making business more competitive	3	
CO3	Analyze and interpret information systems role played by the major types of information systems in organizations and their relationship in supporting the major functional areas of the business between organizations, information systems and business processes, including the processes for customer relationship management and supply chain management in creating efficiencies for businesses.	4	
CO4	Analyze and distinguish the relationships between concepts of information systems, organization, management and strategy for better decision making in supporting various levels of business strategy with information systems	4	

Syllabus

Information Systems in Global Business Today Information Systems Analysis & Design Fundamentals of Data Systems Analytics,Visualization & Engineering, perspectives of information Systems,EBusiness: How Businesses Use Information Systems

Information Technology Infrastructure Enterprise Resource Planning, Business Systems Modelling & Design,Infrastructure components Contemporary Hardware and Software Platform Trends,Foundations of Business Intelligence: Databases and Information management,Telecommunications, the Internet, and Wireless Technology

Achieving Operational Excellence and Customer Intimacy Enterprise Applications,Customer Relation Management Systems Enterprise Applications,E-Commerce: Digital Markets, Digital Goods, Types of Electronic Commerce,M-Commerce Electronic Commerce Payment System

Building and Managing Systems,Managing Projects, importance of project, selecting project,Managing Global Systems The growth of international information systems Organizing International Information Systems,Information Security Governance & Risk Management. Management solution

Reference Books

1. "Management Information Systems: Managing the Digital Firm", Kenneth C. Laudon and Jane P. Laudon, 16th Edition,2020, Pearson.
2. "Management Information Systems for the Information Age", Stephen Haag, 10th Edition, 2021, McGraw-Hill Education.
3. Information Systems Today: Managing in the Digital World, Joseph Valacich and Christoph Schneider, 8th Edition, 2021, Pearson.
4. "Essentials of MIS", Kenneth C. Laudon and Jane P. Laudon, 14th Edition, 2022, pearson.
5. "Business Driven Information Systems", Paige Baltzan and Amy Phillips, 6th Edition,2023, McGraw-Hill Education.
6. "Using MIS", David Kroenke and Randall Boyle, 12th Edition,2022 , pearson.

23EC2104R - ANALOG ELECTRONIC CIRCUIT DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2104R	ANALOG ELECTRONIC CIRCUIT DESIGN	AECD	R	3	0	2	2	4.5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the knowledge of Semiconductor physics and discuss BJT biasing and amplifiers.	3	
CO2	Apply the limitations of BJT, discuss the characteristics and applications of JFET and MOSFET.	3	
CO3	Analyse the characteristics of operational Amplifiers and its applications.	4	
CO4	Analyse the behaviour and applications of Oscillators and multivibrators.	4	
CO6	Conduct, Experiment, and analyse Analog Electronic circuits using myDAQ.	4	
CO7	Simulate and analyze Analog Electronic Circuit using Multisim.	4	

Syllabus

Bipolar Junction Transistors (BJT): BJT Biasing, DC load line analysis and operating point, variation of operating point and its stability, Small Signal Models, Concept of feedback, Design of BJT amplifier, Analysis of amplifier using small signal model.

Junction Field Effect Transistors (JFET): JFET and its characteristics, pinch off Voltage, Drain Saturation Current, JFET biasing, Metal Oxide Semiconductor Field Effect Transistor, Enhancement and Depletion Modes, MOSFET biasing, small signal models, Analysis of amplifier.

Operational Amplifiers: Op Amp Basics, Inverting and Non Inverting Amplifier, Linear and Nonlinear applications of Op Amp, adder, subtractor, integrator, differentiator, comparator, Schmitt Trigger, instrumentation amplifier, active filters.

Feedback & Oscillator Circuits: Feedback topologies and their properties, Oscillators, RC Phase Shift, Wien-Bridge, Hartley and Colpitts. IC 555 timer Monostable and A stable Multivibrator.

Reference Books

1 Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 2009, Pearson, Pentice Hall.

2 Electronic Devices and Circuits, David A. Bell , 2003, Tata McGraw Hils.

3 Electronic Devices , Thomas L. Floyd , 2005, PHI.

4 Linear Integrated Circuits, D Roy Choudhury and Shail B. Jain , 2007, McGraw Hils.

5 Op-Amps and Linear IC Application, Ramakanth A. Gaykwad , 2011, PHI.

23EC2209R - ELECTROMAGNETIC WAVES & TRANSMISSION LINES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2209R	ELECTROMAGNETIC WAVES & TRANSMISSION LINES	EMWTL	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply vector calculus to interpret the behavior of Electrostatics in different media.	3	PO1, PSO1
CO2	Apply the principles of magnetostatics to estimate and evaluate the behavior of the field in different media.	3	PO1, PSO1
CO3	Apply the concepts of Maxwell equations to characterize the uniform plane wave Propagation in lossless and lossy media.	3	PO1, PSO1
CO4	Analyze the propagation characteristics of transmission lines at various frequencies.	4	PO2, PSO1

Syllabus

Static Electric Fields: Coordinate systems, Charge distributions, Coulombs Law, Electric field intensity, electric flux density, Gauss Law and applications, Divergence, Divergence theorem, Potential and Potential difference, Potential gradient. Boundary conditions on E and D. Electric current, current densities, equation of continuity.

Static Magnetic Fields: Biot Savart Law and applications, Ampere circuital law, differential form of Ampere circuital law, Curl, Stoke theorem, Lorentz force equation, force on a current element in magnetic field, Boundary conditions on B and H.

Electromagnetic Waves: Faraday law of Induction, Maxwell Equations in Differential and integral forms. Wave equation for free space, Uniform plane wave general solution and propagation. Wave equations for conducting medium. Wave equations in phasor form, wave propagation in loss less medium, Poynting vector.

Transmission lines: General Solution, input impedance, infinite line, wavelength, velocity, Reflection Coefficient, Open and short circuited lines, lossless line, standing wave ratio, input impedance, open and short circuited lossless lines, Impedance matching.

Reference Books

1 Engineering Electromagnetics , W H.Hayt and J A Buck , 2007 , TATA McGraw-Hill.

2 EM waves and Radiating Systems , EC.Jordan , 2011, PHI.

3 Netwotk Lines and fields, John D Ryder , 2005, PHI.

4 Elements of Electromagnetics, Mathew no Sadiku, 2003, Oxford University Press.

5 Field and Wave Electromagnetics , David K.Cheng, 2004, Pearson Edition.

23EC2226F - WIRELESS COMMUNICATIONS (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EC2226F	WIRELESS COMMUNICATIONS	WC	F	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding of cellular network design principles, analyzing concepts like frequency reuse, channel assignment, handoff strategies, and system capacity to improve performance in wireless communication systems like GSM, W-CDMA, and CDMA.	2	PO1, PO2, PSO2
CO2	Apply their understanding of propagation mechanisms to analyze fading effects in mobile radio channels, utilizing statistical models like Rayleigh and Rician distributions.	3	PO1, PO2, PSO2
CO3	Recognize equalization techniques to combat signal distortion in communication channels, including linear and non-linear equalizers, diversity methods for mitigating fading, and algorithms for adaptive channel equalization.	3	PO1, PO2, PSO2
CO4	Classify wireless networks according to their range and purpose, comparing technologies like Bluetooth for personal connections to WiMax for metropolitan area coverage, and understanding key concepts like IEEE 802.11 standards and 3GPP architecture.	3	PO1, PO2, PSO2
CO5	Analyze cellular network design, propagation mechanisms and signal distortion in communication channels.	4	PO1, PO2, PSO2

Syllabus

Examples of Wireless Communication Systems, Cellular Telephone Systems, 2G & 3G Wireless Networks, Cellular Concept, Frequency Reuse, Channel Assignment Strategies, Hand-Off Strategies, Interference, System Capacity, Improving Coverage and Capacity in Cellular Systems, GSM Architecture, W-CDMA and CDMA.

Free Space Propagation Model, Three Basic Propagation Mechanisms: Reflection, Diffraction, Scattering, Large Scale Fading, Small Scale Fading, Types of Small-Scale Fading, Multipath Propagation, Parameters of Mobile Multipath Channels, Fading Effects Due to Multipath Delay Spread and Doppler Spread, Rayleigh and Rician Distribution Models, Statistical Models for Multipath Fading Channels.

Equalization, Fundamentals of Equalizers, Linear Equalizers, Nonlinear Equalizers, Decision Feedback Equalizers, Maximum Likelihood Sequence Estimation (MLSE Equalizer), Algorithms for Adaptive Equalization, Space Diversity, Diversity Methods: Selection Diversity, MRC, EGC. Polarization Diversity, Frequency Diversity, Time Diversity, Rake Receiver.

Wireless Personal Area Networks (Bluetooth, UWB and Zigbee), Wireless Local Area Networks (IEEE 802.11, Network Architecture, Medium Access Methods, WLAN Standards), Wireless Metropolitan Area Networks (WiMax) and 3GPP Architecture.

Reference Books

1 Wireless and Cellular Communications, William C. Y. Lee, 2nd, The McGraw-Hill Companies, Inc.

2 Wireless Communications Principles and Practice, Theodore S. Rappaport, 2nd, PearsonEducation, 2003.

3 MIMO WirelessCommunications, Ezio Biglieri, Andrea Goldsmith, Arogyaswami Paulraj, 1st, PearsonEducation, 2003.

4 Orthogonal Frequency Division Multiplexing for Wireless Communications, Ye Geoffrey Li, Gordon Stuber, 2006, Springer.

23EE2101 - ELECTRICAL CIRCUITS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE2101	ELECTRICAL CIRCUITS	ELC	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand two-port network parameters (Z, Y, H, ABCD) and their interrelations for circuit design.	2	PO3, PSO1
CO2	Apply transient responses of resistors, capacitors, and inductors under AC and DC conditions.	3	PO3, PO6, PSO2
CO3	Apply network topology techniques (node and mesh analysis) to solve circuit problems.	3	PO3, PO7, PSO3
CO4	Apply Kirchhoff\'s laws to calculate power in three-phase circuits, both balanced and unbalanced. This involves understanding voltage, current distributions, and power factor calculations.	3	PO3, PO5
CO6	Analyze network theorems like Thevenin\'s and Norton\'s, three-phase power flows, and circuit transients. This comprehensive analysis is key to solving complex electrical engineering problems.	4	PO3, PO5

Syllabus

Two port Networks: One port and two port networks, two port network parameters: Z, Y, Transmission and Hybrid parameters and their relationships.

Transients: Response of R-L, R-C, R-L-C (Series and parallel combinations) for impulse, step, ramp excitations. Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C and sinusoidal excitations, initial conditions, time domain and Laplace transform methods of solutions.

Network Topology - definitions, graph, tree, basic cut-set and basic tie set matrices for planar network, Loop and Nodal methods of analysis of networks, duality and dual networks.

Three Phase Circuits: Three phase circuits-phase sequence, star and delta connection, Relation between line and phase voltages and currents in balanced systems, Analysis of balanced and unbalanced 3 phase circuits.

Magnetic circuits: concept of mutual inductance, dot convention, coefficient of coupling, Magnetic Circuits, Analysis of series and parallel magnetic circuits.

Reference Books

1 Network Analysis , M. E. Van Valkenberg , 1998, Prentice-Hall of India Pvt. Ltd. .

2 Engineering circuit analysis , William Hayt and jack E. Kemmerly , 2007, Tata Mc Graw-Hill Companies .

3 Fundamentals of Electric Circuits , Charles K Alexander, Mathew N O Sadiku , 2007, Tata McGraw Hill Education Pvt. Ltd. .

4 Introductory Circuit Analysis, Robert L. Boylestad, 2015, Pearson.

5 Engineering Circuit Analysis, William H. Hayt Jr., Jack E. Kemmerly, Steven M. Durbin, 2018, McGraw-Hill Education.

6 Circuit Analysis: Theory and Practice, Allan H. Robbins, Wilhelm C. Miller, 2012, Cengage Learning.

23EE2102R - ELECTRICAL MACHINES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE2102R	ELECTRICAL MACHINES	ELM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze the performance of single-phase and three-phase Transformers.	4	PO1
CO2	Apply the basic principles of electromechanical energy conversion and DC Generators.	3	PO1
CO3	Apply the basic principles of electromechanical energy conversion to DC Machines and induction machines.	3	PO2
CO4	Apply the basic principles of electromechanical energy conversion to Synchronous Machines.	3	PO2
CO5	Test the performance of Electrical Machines: single-phase and three-phase Transformers, DC Machines, induction machines and Synchronous Machines.	4	PO1, PO5

Syllabus

Transformers: Single-phase transformer: equivalent circuit, phasor diagram, EMF equation, direct load test. open circuit and short circuit tests, regulation, and efficiency; Three-phase transformers: connections, parallel operation; Auto-transformer.

Electromechanical Energy Conversion: Basic principles of Energy, Lorentz force equation, the general expression of stored magnetic energy and Co energy. Force and Torque equations of single and multiple excited systems. DC Generators: Working principle and construction of DC machines, methods of excitation. EMF equation. Circuit models, Armature reaction, commutation process, Compensating winding, Characteristics of various types of generators.

DC. Motors: Working Principle, Torque equation, and types of DC motors. Performance of DC Machines- Testing- Direct, and indirect methods of DC machines. Induction Motor: Constructional features, Rotating magnetic Field, phasor diagram, equivalent circuit, production of torque, torque-slip characteristics.

Synchronous Machines: Alternators-Constructional features. Cylindrical rotor machine- Synchronous Generator-Generated e.m.f., circuit model and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Direct Load Test. Synchronous Motor, principle, starting, hunting, damper windings

Performance of Electrical Machines: Transformers-DC Machines-Induction Motors-Synchronous Machines.

Reference Books

1 Electric Machinery Fundamentals, Stephen J Chapman, Fourth Edition-2005, McGraw Hill, Singapore .

2 Electric Machinery, A.E.Fitzgerald, C Kingsley and S Umans, 7th Edition-2013., McGraw Hill.

3 Theory of Alternating Current Machinery, Alexander S Langsdorf, 2nd ed-2001., Tata Mc Graw-Hill.

4 Electrical Machines, I.J Nagrath& D.P Kothari, 3rd edition-2009., Tata Mc Graw-Hill.

5 Electrical Machines, P.S. Bimbra, 7th Edition-2007, Khanna Publishers.

23EE2204R - ELECTRICAL POWER GENERATION, TRANSMISSION & DISTRIBUTION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE2204R	ELECTRICAL POWER GENERATION, TRANSMISSION & DISTRIBUTION	EPGTD	R	2	1	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the working of various generating stations and the economic aspects of generation.	2	PO7, PSO2
CO2	Apply field concepts to calculate the over-head transmission line and underground cable electrical parameters.	3	PO7, PSO2
CO3	Analyse the performance of overhead transmission lines and AC/DC distribution.	4	PO7, PSO2
CO4	Analyse mechanical sag, corona, Insulators, and substation layouts.	4	PO7, PSO2

Syllabus

Generating stations: Organization of power sector in India, Layout & Operation of Thermal, Hydro, Nuclear and combined cycle power stations. Overview of Solar, Wind Power Plant and Fuel Cells. Economics of generation, load curves, Demand Factor, load factor, diversity factor, Plant Capacity Factor, Plant Use Factor & Utilization Factor, Characteristics of Tariff, Types of Tariffs.

Transmission line parameters: Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines. Underground cable Types of cables, grading concepts, Capacitance of three core belted type cable. Cable sizing.

Transmission line theory: Introduction, short transmission line, medium transmission line, evaluation of A, B, C, D Constants, Surge Impedance Loading of Long Lines, Ferranti effect, elementary concepts of AC and DC distribution.

Corona- factors affecting corona, critical voltages, and power loss; Radio interference due to Corona. Insulators: Types of Insulators, String efficiency and Methods for improvement, calculation of string efficiency, Capacitance grading and Static Shielding. Mechanical sag. Substation practice: Classification of substations, layout, and bus bar arrangements.

Reference Books

1 A Course in Power Systems, J B Gupta, 1987, S. K. Kataria & sons.

2 Electrical Power Systems , C. L. Wadhwa, 1983, New Age International (P) Limited Publishers .

3 Power System Engineering , J. Nagarath and D.P Kothari , 1994, Tata Mc Graw-Hill .

4 A Course in Electric Power , Soni, Gupta and Bhatnagar , 1984, Dhanpat Rai & Sons. .

5 Electric Power Generation, Transmission & Distribution , S. N. Singh , 2003, Prentice Hall India. .

23EE2205R - POWER ELECTRONICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE2205R	POWER ELECTRONICS	PES	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Select appropriate switch for a given power converter	3	PO1, PO7, PSO3
CO2	Analyze the steady state performance of Basic DC-DC converters	4	PO3, PO4, PSO2
CO3	Analyze the performance of Basic Switch-Mode PWM Inverter	4	PO3, PO4, PSO2
CO4	Understand the operation of basic phase-controlled converters	4	PO1, PO7, PSO2
CO5	Test the basic power electronic converters by hardware realization and MATLAB software.	4	PO5, PSO2

Syllabus

Power Semiconductor devices: Ideal Switch Characteristics, Power Diode, SCR, Brief overview of these devices with their characteristics, ratings and applications: IGBT, MOSFET, SiC and GaN power devices

DC-DC converters: Concept of Volt-sec balance, Charge-sec balance and Small Signal ripple approximation, Ideal analysis of non-isolated DC-DC converters: Buck, Boost, Buck- Boost, Boundary conditions between CCM and DCM.

INVERTERS: Voltage source inverters: single phase inverters-performance analysis and switch rating determination, three phase square wave inverters (120, 180 modes of operation), PWM inverters: Sinusoidal PWM uni-polar and bipolar schemes and their application to three phase inverters for speed control of AC drives.

Line frequency phase controlled converters: Concept of phase control, Single-Phase fully controlled converter with R, RL and RLE load (DC drives control), Three-Phase fully controlled Converter, Estimation of line current harmonics, Input Power Factor and distortion factor. AC voltage controllers: Single Phase AC Voltage controllers with R, RL Loads along with applications.

Reference Books

1. Power Electronics Converters Applications and Design", Ned Mohan, Undeland, Robbinds, 3RD, John Wiley and sons Publications.
2. Power Electronics, circuits, devices and applications, M.H.Rashid, 3RD, Prentice Hall (India) Publications.
3. Power Electronics, M.D.Singh and Khanchandani, 2ND, TMH Publications.
4. Power Electronics, Dr.P.S Bimbra, 7TH, Khanna Publishers.

23EE2225F - POWER QUALITY (F)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE2225F	POWER QUALITY	PQ	F	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand various power quality issues.	2	PO2
CO2	Analyze various power quality issues and its causes.	4	PO5, PSO3
CO3	Analyze voltage sag and swell using simulation tools.	4	, PSO3
CO4	Apply different mitigating techniques for improving power quality	3	, PSO2

Syllabus

Introduction to Power or voltage quality, terms and definitions: short duration voltage variations, Interruptions, Voltage sag, Swell, Surges, Harmonics, Voltage fluctuations. Long duration voltage variations: Over voltage, Under voltage, Sustained interruptions, Transients: Impulse transients, Oscillatory transient, Power quality terms. Long Interruptions, Definition, Interruptions, Causes of long interruptions, Origin of interruptions, Limits for the interruptions frequency, Limits for the interruption duration.

Short Interruptions: Definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to reclosing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping, voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

Voltage sag analysis: Voltage sag magnitude, Monitoring, Theoretical calculations, Examples, Sag magnitude in non-radial systems, Voltage calculation in meshed systems, Voltage sag duration, Fault clearing time, Magnitude duration plots- Measurement of sag duration, Magnitude and Phase angle jumps for three phase unbalanced sags, Phase to phase fault, Single phase faults, Two phase to ground faults, High impedance fault, Meshed systems.

Mitigation of Interruptions and Voltage Sags: Overview of mitigation methods, From fault to trip, Reducing the number of faults, Reducing the fault clearing time changing the power system, Installing mitigation equipment, Improving equipment immunity, Different events and mitigation methods. System equipment interface, Voltage source converter, series voltage controller, Shunt voltage controller, combined shunt and series controller. Typical wiring and grounding problems.

Reference Books

1 Understanding Power Quality Problems: voltage sags and interruptions, Math H J Bollen, 1999, IEEE Publications, U.S..

2 Electrical power systems quality , Roger C Dugan, Surya Santoso, Mark F. Mc Granaghan, H. Wayne Beaty , 2012, McGraw-Hill Professional .

3 Hand book of power quality , Angelo Baggini , 2008, John Wiley & Sons Inc .

4 Power Quality in Power System and Electrical Machine , Edward F Fuchr, Mohammad A S Masoum , 2023, Elsevier .

23EE3208R - POWER SYSTEM PROTECTION & CONTROL (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23EE3208R	POWER SYSTEM PROTECTION & CONTROL	PSPC	R	2	0	2	2	3.5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the principle of protective relays & circuit breakers	2	PO1, PO5
CO2	Apply overcurrent, distance and differential schemes for the protection of power system equipment	3	PO1, PO5
CO3	Analyze over voltage protection and economic operation of power system	4	PO1, PO5
CO4	Understand automatic generation control and voltage regulators	2	PO1, PO5
CO5	Test the characteristics of power system protective relays and Operation of power systems through programming/simulation	4	PO1, PO5
CO6	Build the protection system for electrical distribution system	4	PO1, PO5

Syllabus

Power System Protection: Introduction, need for protective systems, nature and causes of faults, essential qualities of protection, zones of protection, primary and backup protection, Classification of protective relays & Schemes- over current, differential and distance protection, Arc voltage, Arc interruption, re-striking and recovery voltage, resistance switching, current chopping, Classification of circuit breakers and their ratings.

Protection against Over Voltages: Causes of over voltages, ground wires, lightning arresters, Neutral Grounding: Necessity of earthing, step voltage, Types of neutral grounding.

Economic Dispatch: Optimal operation of generators on a Bus Bar, optimum generation scheduling with and without constraints.

Automatic Generation Control & Automatic Voltage Regulator: Load frequency control single area (Single area case), Load frequency control and economic dispatch control, Automatic voltage control, AVR block diagram.

Reference Books

1 Modern Power System Analysis, D. P. Kothari, I. J Nagrath, 2003, Tata Mc-Graw Hill Publications.

2 Power System Protection and Switchgear, Badri Ram, D N Vishwakarma, 1995, ata Mc-Graw Hill .

3 Power System Analysis, 1. Jhon J Grainger, William D Stevenson Jr, 1994, Tata Mc-Graw Hill Publications.

4 Switch Gear Protections, Sunil S Rao,, 2008, Khanna Publications.

23IN2101R - IOT SYSTEM DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23IN2101R	IOT SYSTEM DESIGN	IOTPA	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the concepts of IoT Architecture and technologies	3	PO2, PO5, PO9, PSO2
CO2	Apply the logical design of IoT system	3	PO2, PO5, PO9, PSO2
CO3	Apply IoT networking protocols and Authentication Protocols for IoT Application layer.	3	PO2, PO5, PO9, PSO2
CO4	Apply IoT protocols and programming concepts for real-world problems.	3	PO2, PO5, PO9, PSO2
CO5	Develop IoT based applications using IoT Protocols	5	PO2, PO5, PO9, PSO2

Syllabus

IoT Reference Architecture: Introduction to IoT, Characteristics of IoT, IoT Architecture, Physical Design of IOT, Logical design of IoT, IoT enabling Technologies, IoT Levels & Development Templates, Difference between IoT and M2M, SDN and NFV for IoT. RFIDs, and wireless sensor networks technology. IoT Programming language and Tools.

Module 2 IoT Communication Technologies: wired - ModBUS, Wireless - Bluetooth, BLE, IEEE 802.11, IEEE 802.15, Zigbee, SIGFOX. IoT Networking Protocols: IPv4 and IPv6.6lowPAN, TCP/IP, IP addressing of IoT devices MAC addresses of communication circuit.

IoT Communication Technologies: wired UART, USART, SPI, I2C, ModBUS, CAN, Ethernet, USB. Wireless, Bluetooth, BLE, IEEE 802.11, IEEE 802.15, Zigbee, SIGFOX. IoT Networking Protocols: IPv4 and IPv6.6lowPAN, TCPIP, IP addressing of IoT devices MAC addresses of communication circuit. Web connectivity for connected devices Application Protocols HTTP, Web sockets, Node, MQTT, UDP, CoAP, XMPP, AMQP and gateway protocols. Link Layer protocols: 802.3, Ethernet 802.11 WiFi 802.16, WiMax 802.15.4, LR, WPAN,2G,3G.4G. Cloud storage Models and Communication APIs. Web application management protocol, Python web application framework.

IoT design considerations, Prototyping IoT solutions, Design IoT development Frameworks: Case studies illustrating IoT design: Home Automation: Smart lighting, Smart Appliances, Cities: Smart Parking, Smart Lighting, Smart Roads, Emergency response, Environment: Weather monitoring, Air Pollution Monitoring, Noise pollution, Forest fire, River flood, Agriculture: Smart irrigation, Green House control.

Reference Books

1 Internet of Things: Principles and paradigms., Buyya, Rajkumar, and Amir Vahid Dastjerdi,, 2016, Elsevier.

2 IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,, 2017, CISCO Press.

3 Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, 2014, Academic Press.

4 Enabling things to talk, Bassi, Alessandro, 2016, Springer.

23IN3104R - REAL TIME OPERATING SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23IN3104R	REAL TIME OPERATING SYSTEMS	RTOS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand subsystem components of the Kernel and apply the CPU Scheduling algorithms.	3	PO2, PO5, PO6, PSO2
CO2	Understand memory and process virtualization and Paging, apply Page Replacement Algorithms	3	PO2, PO5, PO6, PSO2
CO3	Understand and Apply the threading issues for RTOS	3	PO2, PO5, PO6, PSO2
CO4	Understand and Apply the memory management concepts in RTOS	3	PO2, PO5, PO6, PSO2
CO5	Able to perform experimentation Real-Time Operating Systems Other Basic Operating System Functions	3	PO2, PO5, PO6, PSO2

Syllabus

Operating System Functionalities, Types of Operating Systems, Process Virtualization: Processes, Process API code, Direct Execution, CPU Scheduling, Multi-level Feedback, Lottery Scheduling code, Multiprocessor Scheduling.

Memory Virtualization: Address Spaces, Memory API, Address Translation, Segmentation, Free Space Management, CPU Virtualization Basics, Introduction to Paging, Translation Look Aside Buffer, Swapping, Demand Paging, Thrashing, Page replacement algorithms.

Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals.

Module 4 Messages, Buffers, mailboxes, queues, semaphores, deadlock, priority inversion, PIPES MEMORY MANAGEMENT: - Process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection.

Reference Books

1 Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, 3rd , Wiley..

2 Real-time systems, Jane W. S. Liu, 2nd, Prentice Hall .

3 Linux Kernel Development, Robert Love, 3rd Edition (2010), Addison-Wesley Professional.

4 Operating Systems: Internals and Design Principles, William Stallings, 9th edition, Pearson.

23IN3105R - EMBEDDED SYSTEMS DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23IN3105R	EMBEDDED SYSTEMS DESIGN	ESD	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Embedded C programming concepts and apply for embedded system design.	2	PO3, PO5, PSO2
CO2	Apply GPIO and HAL concepts to interface various input output devices.	3	PO3, PO5, PSO2
CO3	Apply UART, I2C communication protocols to interface real time devices.	3	PO2, PO5, PSO2
CO4	Analyze state flow models for embedded system applications	4	PO3, PO5, PSO2
CO5	Design and develop real world applications using embedded system design principles.	4	PO2, PO5, PSO2

Syllabus

Overview of embedded systems, importance of processors/microcontrollers, Embedded C programming, debugging tools, data types, arrays, pointers, and storage classes: comprehensive syllabus covering key aspects in embedded system design and programming.

Introduction to HAL library in embedded C, GPIO programming with external devices using HAL, configuring ADC registers: comprehensive syllabus covering hardware abstraction and peripheral interfacing in embedded systems.

Programming timers and related control registers, applications of timer in time-sharing system, Concept of compare/capture modes, and applications of timers in PWM control, Interrupt programming with Hal :Interrupt priorities. Communication Protocol: UART, SPI Programming

SPI, I2C, UART, and Bluetooth enable STM32 interfacing for data communication and peripheral connectivity: syllabus covering essential communication protocols for effective interfacing in embedded systems.

Reference Books

1. "Programming with STM32: Getting Started with the Nucleo-Board and C/C++" , Donald Norris , 2018, McGraw Hill Education .
2. "Programming Embedded Systems in C and C++" , Michael Barr and Anthony J. Massa , 1999, O'Reilly Media .
3. Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C, Yifeng Zhu , 2018, Andrew Hayford .
4. The 8051 Microcontrollers & Embedded Systems, Muhammad Ali Mazidi , 2007, Pearson .

23ME1002 - ENGINEERING GRAPHICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME1002	ENGINEERING GRAPHICS	EG	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Enumerating engineering curves, Listing various geometries and descriptions on multiple scales.	2	PO1, PO5, PSO1
CO2	Apply the concept of first-angle and third-angle projection,	3	PO1, PO5, PSO1
CO3	Demonstrate sectional view and sketching in modern tools.	3	PO1, PO5, PSO1
CO4	Apply the engineering design process to real world problems	3	PO1, PO5, PSO1

Syllabus

Introduction to Engineering Drawing Principles of Engineering Graphics and their significance Drawing Instruments and their Use Conventions in Drawing Lettering Conic Sections Ellipse Parabola Hyperbola and Rectangular Hyperbola oblong concentric method Special Curves Cycloid Epicycloids Hypocycloid and Involutes Scales Plain and Vernier scales

Projection of Lines points and Projections of Planes First and Third Angle Projections of Points and Lines inclined to planes True lengths, traces Constructions Projections of regular planes inclined to both planes

Projections of Solids and Developments of surfaces Projections of Regular solids inclined to one plane Sections and Sectional Views Right Regular Solids Prism Cylinder Pyramid Cone Surface development of right regular solids Prisms Cylinder Pyramid cone and their parts Understand the fundamentals of modelling and design for manufacturing

Orthographic Projection in First Angle Projection and Isometric Projections Principles of Orthographic Projections conventions Principles of Isometric Projection Isometric Scale Isometric view conventions Isometric View of Lines Plane Figures and simple problems Transformation of Projections Conversion of Isometric Views to Orthographic Views Conventions Analyse manufacturing processes and their impact on product design. Utilize Fusion 360 software for computer aided design (CAD) modeling and visualization

Reference Books

1 Engineering Drawing , N.D.Bhat/ Charotar , 3rd Edition 2011, Pearson Education .

2 Engineering Graphics, , Agrawal B. &Agrawal C. M , 2012, TMH Publication. .

3 Fundamentals of Engineering Drawing , .W.J. Luzadder and J.M. Duff , 11th edition 2015, PHI learning .

4 Visualization, Modeling, and Graphics for Engineering Design , D.K. Lieu and S.A. Sorby , 2nd Edition 2016, Cengage Learning .

23ME1004 - WORKSHOP PRACTICES FOR ENGINEERS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME1004	WORKSHOP PRACTICES FOR ENGINEERS	WPE	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Prepare carpentry joints, fitting trade fits, tin-smithy components, and house wiring.	3	PO6, PO8, PSO1
CO2	Prepare mould cavities, perform lathe, drill, grinding operations, create welding joints, and CNC programs.	3	PO6, PO8, PSO1

Syllabus

Carpentry, including simple exercises in woodworking, pattern making, fitting operations, and power tools, along with electrical wiring and sheet metal working

Welding (arc welding), moulding, and casting alongside manufacturing methods such as drilling, turning, milling, surface grinding, and code preparation for CNC machining

Reference Books

1 Elements of Workshop Technology , Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K. , 3rd Edition , Media promoters and publishers private limited, Mumbai. .

2 Production drawing , K.L.Narayana and P.Kannaiah , 2nd Edition , New Age International .

3 Processes and Materials of Manufacture , Roy A. Lindberg , 4th edition , Prentice Hall India .

4 Manufacturing Engineering and Technology, Kalpakjian S. And Steven S. Schmid, 4th edition, Pearson Education India Edition.

23ME2107R - THERMODYNAMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME2107R	THERMODYNAMICS	TD	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Examine the basic terminology used in thermodynamics	2	PO1, PSO2
CO2	Apply first law of thermodynamics to various flow and non-flow processes.	3	PO1, PSO3
CO3	Apply second law of thermodynamics and principle of entropy to Engineering Devices	3	PO1, PSO3
CO4	Apply thermodynamic principles to estimate the performance of different air standard cycles and different psychrometric processes	3	PO2, PSO3

Syllabus

Fundamental Concepts and Definitions: Thermodynamic system and control volume, macroscopic and microscopic points of view, thermodynamic properties, processes, state, path, cycle, thermodynamic equilibrium and quasi-static process. Reversible and irreversible processes

zeroth law, concept of temperature. Work and Heat: Definition of work, units, work done at the moving boundary of system, work done in various non-flow processes, definition of heat, units, comparison of heat and work. First Law of Thermodynamics for Non-Flow Systems: First law of thermodynamics for a closed system undergoing a cycle and for a change of state; energy - a property of system, internal energy and enthalpy. Specific heat at constant volume and constant pressure. First Law of Thermodynamics for Flow Systems: Control mass, control volume, first law of thermodynamics for a control volume, steady flow energy equation and applications to engineering equipment and PMM-1

Second Law of Thermodynamics: Thermal reservoirs, Kelvin-Plank and Clausius statements of second law of thermodynamics; Equivalence of Kelvin-Plank and Clausius statements, PMM-2; Carnot cycle, Carnot engine, corollary of Carnot\'s theorem, absolute thermodynamic temperature scale. Entropy: Definition of entropy, Clausius theorem, entropy change in reversible process temperature-entropy plot, inequality of Clausius, entropy change in an irreversible process, principle of increase of entropy, applications of entropy principle, entropy change of an ideal gas; availability and irreversibility. Air standard cycles: Performance analysis of Otto ,Diesel,Dual,and Brayton cycles.

Psychometric: Psychrometric properties, psychrometric chart and air-conditioning process -Sensible heating and cooling Humidification and dehumidification,Mixing of air streams Adiabatic saturation process Psychrometric process equationsBasic components of air conditioning systems Types of air conditioning systems

Reference Books

1 Thermodynamics, an Engineering Approach , Yunus A. Cengel & Michael Boles , 2,1990, Tata McGraw Hill, NewDelhi .

2 Engineering Thermodynamics , P. K. Nag , 4,1995, Tata McGraw Hill, NewDelhi. .

3 Engineering Thermodynamics , Cohen and Rogers , 1,1995, Pearson Education India limited. .

4 Thermodynamics , E Rathakrishnan , 2,2005, Eastern economy edition .

23ME2208 - MANUFACTURING PROCESSES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME2208	MANUFACTURING PROCESSES	MP	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Identify the casting processes	3	PO1, PO5, PO10, PSO1
CO2	Select the appropriate welding processes	3	PO2, PO5, PO9, PSO1
CO3	Apply principles of cold/hot forming processes	3	PO1, PO4, PO7, PSO2
CO4	Utilize sheet metal processes and design sheet metal dies	3	PO3, PO5, PO8, PSO3
CO5	Fabricate the parts using manufacturing processses	3	PO6, PO9, PO10, PSO2

Syllabus

Overview of metal casting processes, key terms, sand mould making, patterns, allowances, design considerations, gating systems, special methods like shell moulding, investment casting, die casting, centrifugal casting, and inspection for casting defects.

Overview of joining processes, types of joints, and welding terminology. Includes gas welding, arc welding (GTAW, GMAW, SAW), resistance welding, thermit welding, electron beam, laser welding, friction welding, welding design considerations (heat input, heat flow), and common welding defects (undercut, incomplete fusion, porosity, slag inclusion, cracks, lamellar tearing, residual stresses)

Overview of metal forming processes, plastic deformation, and hot and cold forming. Includes principles of rolling and forging, rolling stand arrangement, roll force, power requirements, forging operations and design, defects and remedies. Also covers extrusion principles, hot and cold extrusion, extruding tubes, wire drawing, and rod and tube drawing.

Sheet Metal Forming Processes - Press Tool Operations, Shearing Action, Sharing Operations, Bending Sheet and Plate, Common Bending Operations, Stretch Forming, Deep Drawing, Spinning , Explosive and Magnetic-Pulse Forming Processes

Preparation of parts using casting and welding methods

Reference Books

1 Manufacturing Technology , P.N Rao, Third Edition, The McGraw-Hill Companies.

2 Manufacturing Engineering and Technology, Serope Kalpakjian Steven R Schmid, Fourth Edition, Pearson Education, Inc..

3 Processes and Materials of Manufacture, Lindberg, Third Edition, Prentice hall India (p) Ltd.

4 Mechanical Metallurgy, Dieter, Revised Edition, McGraw-Hill.

23ME2209R - KINEMATICS & DYNAMICS OF MACHINES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME2209R	KINEMATICS & DYNAMICS OF MACHINES	KDOM	R	3	1	2	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the basic principles and concepts of kinematics and mobility of the mechanisms.	3	PO1, PO5
CO2	Analyze and kinematic design of mechanisms and machines using velocity and? acceleration analysis.	4	PO1, PO5
CO3	Apply principles of cams to draw cam profiles and understand gear systems and gear trains for various applications.	3	PO1, PO5
CO4	Understand the principles of balancing and vibrations and analyze gyroscopic effect on naval ships and automobiles.	4	PO1, PO5
CO5	Apply and analyze the concepts learned in theory to perform experiments related to mechanisms and machines using the ADAMS simulation software for data analysis.	4	PO1

Syllabus

Introduction to Kinematics and Dynamics of Machines: Basic concepts and definitions, Types of motion, Degrees of freedom,Kinematics of Mechanisms: Linkages and mechanisms.

Velocity and acceleration analysis of Mechanisms by IC and relative velocity method.

Cams: classification, knife-edge, roller followers; Gears: terminology, fundamental law, contact lengths, interference, gear trains: simple, compound, reverted, epicyclic.

Balancing by static and dynamic methods, force transfer between planes, balancing reciprocating masses, and gyroscope effects on vehicles. Machine vibrations, free/forced vibrations, critical speeds, and isolation.

Reference Books

1 Theory of Machines, S S Ratan, 2017, Tata McGraw-Hill Education.

2 THEORY OF MECHANISMS AND MACHINES, Amitabha Ghosh, Asok Kumar Mallik, 1998, Affiliated East-West Press Pvt. Ltd..

3 Kinematics and Dynamics of Machines, George H. Martin, 2002, McGraw-Hill.

4 Theory of Machines and Mechanisms, John J. Uicker Jr., Gordon R. Pennock, Joseph E. Shigley, 2014, Oxford University Press.

5 The Theory of Machines through Solved Problems, J.S. Rao, 1996, New Age International.

23ME3110R - HEAT TRANSFER (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME3110R	HEAT TRANSFER	HT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Fourier law of conduction and combined conduction convection concepts to 1-D heat transfer problems	3	PO1, PO2, PSO1
CO2	Analyze heat transfer through extended surfaces and apply unsteady state heat transfer to various systems	4	PO1, PO2, PSO1
CO3	Apply the emperical correlations for solving convection heat transfer and heat transfer through during phase change problems	3	PO1, PO2, PSO1
CO4	Analyze various types of heat exchangers by applying the principles of conduction, convection, radiation	4	PO1, PO2, PSO1
CO5	Analyze various parameters of heat transfer in different thermal systems physically/numerically	4	PO1, PO2, PSO1

Syllabus

Introduction to fundamental processes of heat transfer and their governing laws. 1-D steady state heat conduction in single and multi-layered plane walls, cylinders and spheres along with concepts of thermal contact resistance and critical thickness of insulation. One dimensional heat conduction with internal heat generation

Fins-applications and performance analysis; Transient conduction-lumped capacitance, semi-infinite body and application of Heisler and Grober charts

Elementary convection including laminar and turbulent boundary layers in external flows and internal flows of forced convection, natural convection. Heat transfer in boiling and condensation

Basic concepts of heat exchangers; Thermal radiation-Stefan-Boltzmann law, small object in a large enclosure, parallel plates and shape factor

Reference Books

1 Introduction to Heat Transfer , Incropera, F. P. and Dewitt, D. P , 2th edition, 1994, John Wiley and Sons. .

2 Heat transfer A practical approach , Yunus A. Cengel , 4th edition, 2003, Tata McGraw Hill.

3 Heat Transfer - A Conceptual Approach , P. K. Sarma and K. Ramakrishn, 4th edition, 2006, 2006 .

4 Heat and Mass Transfer, R. K. Rajput,, 2th edition 2008, S. Chand & Company Limited .

5 Heat and Mass Transfer Data Book, C. P. Kothandaraman, 8th edition 2017, NEW AGE INTERNATIONAL PUBLISHERS.

23ME3111R - MECHANICAL ENGINEERING DESIGN (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME3111R	MECHANICAL ENGINEERING DESIGN	MED	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply engineering design phases and general considerations to design any machine component	3	PO2, PSO2
CO2	Apply the mechanical behavior of engineering materials concept to solve any material failure problem	3	PO2, PSO2
CO3	Analyse the machine components for static strength	4	PO2
CO4	Analyse the machine components for fatigue strength	4	PO2

Syllabus

Design Philosophy, Need Identification and Problem Definition, Concept Generation and Evaluation, Embodiment Design. General considerations and procedure in machine design, Codes & Standards, Reliability, Preferred numbers

Selection of Materials and Shapes: Mechanical behavior of engineering materials, Selection of Materials, Selection of Shapes. Fundamentals of mechanical behavior of materials, as well as design with materials: elasticity, plasticity, fatigue, fracture, and creep

Design for Static Strength: Simple Stresses - Combined stresses - Torsional and Bending stresses - Factor of safety and theories of failure

Design for Fatigue Strength: Stress concentration, Methods of reducing stress concentration, design for fluctuating stresses, Endurance limit, Estimation of Endurance strength, Notch sensitivity, Goodman line and Soderberg line, Combined fluctuating stresses

Reference Books

1 Design of machine elements , V. B. Bhandari , 5th;2020, McGraw-Hill International .

2 Machine Design , Robert L. Norton , 5th;2018, Pearson.

3 Shigley's Mechanical Engineering Design , Richard G Budynas; J Keith Nisbett , 11th;2020, McGraw-Hill International .

4 Materials selection in Mechanical Design , Michael F. Ashby , 5th;2019, Elsevier Butterworth-Heinemann .

23ME3113R - MANUFACTURING TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23ME3113R	MANUFACTURING TECHNOLOGY	MT	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Utilize the concept of metal cutting processes	3	PO1, PO5, PO10, PSO1
CO2	Select appropriate machine tool to prepare desired objects	3	PO1, PO2, PO5, PSO2
CO3	Make use of non-traditional machining processes	3	PO2, PO5, PO6, PSO2
CO4	Construct the automation of production lines	3	PO4, PO5, PO10, PSO1
CO5	Apply the concepts of modern manufacturing processes	3	PO1, PSO3

Syllabus

Overview of metal cutting, single and multi-point cutting tools, orthogonal and oblique cutting, force components, Merchant\'s force circle diagram, chip formation, tool wear and life, cutting tool materials, and cutting fluids.

Machine Tools, Introduction to Lathe, milling, drilling, boring, shaper, slotter, planer. Mechanics and operations, principles of work holding, jigs and fixtures

Nontraditional machining processes, Introduction to Abrasive Jet Machining, Water Jet Machining, Ultrasonic Machining, Electrical Discharge Machining and Electro chemical machining, principle and process parameters, MRR

Automation and CNC, Reasons and strategies of Automation, Basic Components of NC, CNC, DNC. Economics and comparison, Absolute and Incremental Positioning, CNC Programming for Turning, Milling and Drilling operations

Reference Books

1 Processes and Materials of Manufacture, Lindberg, Revised edition, Prentice hall India (p) Ltd.

2 Manufacturing Engineering and Technology, Serope Kalpakjian, 4rth Edition, Prentice Hall .

3 Mechanical Metallurgy, Dieter, Revised edition , Mc Graw.

4 Advanced Machining Processes, Vijay K Jain , Revised Edition, Allied Publishers Pvt Limited.

23SDEE01A - VISUALIZATION AND MODELING OF CIRCUITS (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDEE01A	VISUALIZATION AND MODELING OF CIRCUITS	VAMC	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the use of symbols,wires, components, in Auto cad Electrical drawing and perform project management	3	PO3, PO5, PSO1
CO2	Analyze the workflow in Autocad Electrical with ladder diagrams and PLCs	4	PO5, PSO2
CO3	Analyze Panel Layout from Electrical drawing schematics.	4	PO4, PO5, PSO3
CO4	Analyze report generation from panel layouts.Draw 3D models.	4	PO4, PO5, PSO3

Syllabus

AutoCAD Electrical: Basics of Electrical Drawings, Introduction to AutoCAD Electrical and Interface, project manager, Basics of Electrical Drawings- Common Symbols in Electrical Drawings, Wire and its Types, Labelling - Install and configure AutoCAD Electrical Start AutoCAD, understand components of the initial AutoCAD Electrical screen, commands, various commands to save a file, Exit AutoCAD, Create and manage workspaces, Using various options in AutoCAD help.

Workflow in AutoCAD Electrical, Starting a New Project, Changing Properties of a project, Adding drawings in the project, Inserting Components using Icon menu, Catalog Browser, User Defined list, Equipment list, Panel list, Terminal (Panel list) components. Inserting Wires, applying wire numbers, inserting user defined circuits , ladders , Cable Markers and Circuit Builders. Inserting Parametric PLCs, connectors and terminals.

Panel Layout- Create panel layouts from schematic list, create panel layouts from schematic list, Annotate and edit a footprint, insert footprints from icon menu, add a new record of footprint to the footprint lookup table.

Reports- Generate schematic and panel reports, Change the report format, Place reports in a drawing, Save reports to external files, Plot reports; AutoCAD Electrical with Inventor. Draw 3D models.

Reference Books

1. AUTOCAD ELECTRICAL 2022 BLACK BOOK, Gaurav Verma, Matt Weber , 2021, Independent Publishing Platform.
2. AutoCAD Electrical 2023 for electrical control designers , Sham Tickoo , 2022, Cadcim Technologies .
3. AutoCAD Electrical 2021 : A tutorial approach , Sham Tickoo, 2020, Cadcim Technologies .
4. AutoCAD Electrical 2021 : Fundamentals with NFPAstandards: Autodesk authourized publisher, Ascent , 2020, Ascent -Center for technical knowledge .
5. Electrical Engineering Drawing , S.K. Bhattacharya , 2022, New age international publishers .
6. Computer Aided Electrical Drawing Electrical Engineering Drawing , M Yogesh BS Nagaraja N Nandan , 2014, PHI Learning Private Limited.

23SDIN01A - IOT HARDWARE PROGRAMMING (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDIN01A	IOT HARDWARE PROGRAMMING	IOTHP	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Able to access and implement the preliminary softwares for ESP 32 Development board	3	PO1, PO2, PSO2
CO2	Able to apply the basic concepts using raspberry Pi	3	PO1, PO2, PSO2
CO3	Able to apply the communication Protocols using Raspberry Pi	3	PO1, PO2, PSO2
CO4	Able to access the cloud database for data posting and monitoring using raspberry Pi	4	PO2, PSO3

Syllabus

ESP 32 Introduction, Pin Configuration, Features, Applications, Software and Driver Tools, Arduino IDE installation, ESP32 Boards manager package installation, GPIO, SERIAL COMMUNICATION, Posting data to cloud database

Raspberry pi Introduction, Pin Configuration, Features, Applications, Software and Driver Tools, raspberry pi OS installation, GPIO, control LEDs, Switches, motors, Actuators.

Raspberry pi Communication Protocol, Connecting Raspberry Pi to cloud platforms, uploading sensor data to the cloud, Implementing cloud-based dashboards and remote control of devices.

IoT Project Development: Designing and implementing IoT projects using Raspberry Pi, integrating sensors, actuators, and communication protocols, Testing, debugging, and deploying IoT applications. Home Automation using Raspberry Pi, Distributed Computing Cluster

Reference Books

1 Getting Started With Raspberry Pi - Getting to Know the Inexpensive ARM-Powered Linux Computer, Matt Richardson, Shawn Wallace, and Wolfram Donat, 4(Grayscale Indian Edition), Shroff Publishers.

2 Raspberry Pi Cookbook, Simon Monk, 1, O'Reilly Media.

3 Exploring Raspberry Pi, Derek Molloy, 2, Wiley.

4 Internet of Things: A hands-on Approach, A.Bahga and V.Madisetti, 2, University Press.

23SDME01A - VISUALIZATION AND MODELLING FOR ENGINEERING DESIGN (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
23SDME01A	VISUALIZATION AND MODELLING FOR ENGINEERING DESIGN	VMED	A	0	0	6	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the concepts of Orthographic projection to Generate the views and sectioning.	3	PO2, PO6, PSO2
CO2	Prepare the assembly drawing of engine parts, machine Components both in conventional form and then by using software.	3	PO2, PO6, PSO2
CO3	Generate detail drawings of individual parts of an assembled machine Component both in conventional form and then by using software.	3	PO2, PO6, PSO2
CO4	Generate Production Drawings by considering Limits, tolerances and fits, Surface roughness .	3	PO2, PO6, PSO2

Syllabus

Review: Orthographic projection, missing lines, Interpolation of views and sectioning Specification of materials: Engineering materials, code designation of steels, copper, and aluminium and its alloys.

ASSEMBLY DRAWINGS: Introduction, stuffing box, screw jack, Lathe tailstock, gate valve, steam engine cross head.

PART DRAWINGS: I C Engine connecting rod, Single Tool Post, spark plug, safety Valves etc Production drawing: Introduction to developing and reading of production drawing of simple machine elements like helical gear, bevel gear, flange, pinion shaft, connecting rod, crank shaft, belt pulley, piston details etc, idea about tool drawing.

Limits, tolerances and fits: Introduction, limit systems, tolerance, fits drawing exercises. Surface roughness: Introduction, surface roughness, machining symbols, identification of surface roughness drawing exercises. Computer aided drawing: Introduction, input, output devices, introduction to drafting software like Creo/ Solidworks, basic commands and development of simple 2D and 3D drawings.

Reference Books

1 Machine Drawing , K L Narayana, P Kannaiah & K Venkat Reddy , 3rd Edition June 2009, New Age .

2 Machine Drawing , N D Bhatt , 51th Edition 2023, Charotar .

3 Production Drawing , K L Narayana, P Kannaiah & K Venkat Reddy , 3rd Edition 2014, New Age.

4 Machine Drawing , Siddeswar, Kannaiah and V V S Sastry , 1st Edition 2017, TMH.

5 Autodesk Fusion 360: A Power Guide for Beginners and Intermediate Users, John Willis (Author), Sandeep Dogra (Author), Cadartifex (Author), 1st Edition 2018, CAD Arti flex.

24AD2001R - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AD2001R	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	AIML	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply a variety of artificial intelligence algorithms and techniques to effectively solve complex problems in diverse real-world environments	3	PO2, PO3, PO4, PSO1
CO2	Demonstrate proficiency in formulating and solving constraint satisfaction problems, employing knowledge engineering principles to perform inferencing, reasoning and probability theory.	3	PO2, PO3, PO4, PSO1
CO3	Proficient in understanding and applying various machine learning techniques to analyze and solve real-world problems	3	PO2, PO3, PO4, PSO1
CO4	Demonstrate proficiency in advanced supervised learning techniques and unsupervised learning techniques to solve complex real-world problems.	3	PO2, PO3, PO4, PSO1
CO5	Build solutions for various AI & ML related problems	5	PO3, PO4, PO5, PSO1

Syllabus

Introduction to Artificial Intelligence: Overview of AI, history, and applications; Agents and Environments; Problem Solving through search: Uninformed Search Algorithms: Breadth-first search, Depth-first search, Iterative deepening search, Depth Limit Iterative deepening search Bi-Directional Search; Informed Search: Heuristic search, Best First Search, A* algorithm, Local Search algorithms: Hill Climbing Algorithm, Simulated Annealing, Adversarial Search: Minimax algorithm, Alpha-beta pruning;

Constraint Satisfaction: Problem formulation, Constraint propagation, Backtracking algorithms, Knowledge Engineering: propositional Logic, Predicate Logic, Inferencing through propositional and Predicate Logic: Introduction, Inferencing rules, Inferencing Mechanisms: Entitlement, Resolution, Lifting, Reasoning, Implementing inferencing: Forward Checking and Backward Chaining; Introduction to probability theory, Introduction to uncertainty Bayes Theorem;

Machine Learning: Introduction to Machine Learning, Types of Machine Learning; Introduction to Data Preprocessing: Data Cleaning, Data Splitting, Data Normalization, Data Batching, Data Shuffling, Overfitting and Underfitting; Performance metrics: Confusion matrix, Accuracy, F-score, Precession and Recall, Cross Validations; Supervised learning: Linear regression, Logistic Regression, Naive Bayes Classification, Bayesian Belief Networks; Decision Trees, KNN; Support Vector Machines (SVM), Introduction to Ensemble methods.

Ensemble methods: Bagging: Random Forest, Boosting: XG Boosting, Ada-Boosting, Unsupervised learning algorithms: K-Means clustering, Hierarchical Clustering Artificial Neural Networks (ANN): Introduction to ANN: Weights and Bios, Bios Vs Variance, McCulloch Pits, Perceptron, Applications of ANN, Types of ANN: Single-Layer Perceptron, Multi-Layer Perceptron, Feedforward and Backwards ANNs, Recurring RNN, Basics of ANN: Structure of ANN, Functionality of ANN, Learning ANNs, ANN techniques: Activation functions, Error computation (Loss Functions), Error distribution(Optimization), and Prediction using ANN.

Reference Books

1 Artificial Intelligence, Russel and Norvig, 3rd Edition, 2015, Pearson Education, PHI.

2 Artificial Intelligence, Patrick Henry Winston, 3rd Edition, 2017, Pearson Education, PHI.

3 Machine Learning, Tom M.Mitchell, 1st Edition, 2017, McGrawHill.

4 Machine Learning an Algorithmic Perspective, Stephen Marsland, 2nd Edition, 2014, CRC Press.

24AG1102 - FILM AESTHETICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG1102	FILM AESTHETICS	FAS	R	2	1	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction to the craft of film making and its 24 crafts in detail	1	PO1
CO2	Understanding the phases in project production and nuances offilm production	2	PO2
CO3	Analyzing the project outcomes of technical and non-technicalaspects in film-making	3	PO3, PO5
CO4	Evaluating the script components along with the executionelements thus creating a film	4	PO3, PO4
CO5	Creating an output of Quickies	5	PO2, PO5

Syllabus

An introduction to the 24 crafts of a film - Acting, Direction, Cinematography, Onlineproduction, Editing, Audiography, Publicity Designing being the significant crafts among 24 crafts of a filmUnit

An introduction to the three phases in Film Production - Works that happen during each phase

From script to screen, script elements, script submissions, Directing a shot, Directing a scene, sequenceand Act

Executing the project, application of clapboard, EDL, EL, Packaging a film, Distribution,Promotion and Exhibition of a film

Reference Books

1 Film art: An introduction, David Bordwell, Kristin Thompson, 2021, McGraw-Hill Education.

2 Understanding Movies, Louis Giannetti, Scott Eyman, 2017, Pearson.

3 Looking at movies : an introduction to film, Richard Barsam, Dave Monahan, 2016, W. W. Norton & Company.

4 Film theory and criticism: Introductory readings, Leo Braudy, Marshall Cohen, 1992, Oxford University Press.

24AG1103 - DRAWING BASICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG1103	DRAWING BASICS	DBS	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Basics of drawing styles and anatomy & compositional skills	2	PO1
CO2	Practicing photographic memory and Sense of imagination for painting/ sculpture mediums.	2	PO2
CO3	Apply the techniques of drawing for various purposes , planning of compositions & its expressions.From anatomy to contemporary contours students must to learn the varioations and its utilities	3	PO3
CO4	Explaining the concepts with the support of drawings in their new drawing purposefully	4	PO4
CO5	Evaluating the process of developing ideas in drawing concept	5	PO5

Syllabus

Skull planes, Masses, Details, Proportions, Portraiture, Compositional Analysis, Theories, and treatments. Unit-I Anatomy Drawing: Starting from the construction of skull-planes and masses of head, details such as eyes, nose, mouth, etc. Relative proportions amongst head, neck, and shoulders. The student has to prepare for every part of the body like the skull, Torso, legs, hands, body in movement, foreshortening views, etc detailed study of Bone, muscle, the contour of human, animal, and bird. .Freehand Sketching: At least 10 sketches daily related to the subject assignments to improve their ability towards the professional way

Objective and Figurative: General characteristics and specific contour values of material properties understanding, Study of light & shades, Study of different materials in different compositions, Including still life objects and natural elements with quality output. Geometrical & Perspective Drawing

Cultural Drawing: Different civilizations approach withdrawing from Cave paintings, medieval art, and design, Folk art, traditional arts, pre, and postindependence art, and contemporary art practice. Transformation Drawing: Process of converting an idea

Animation & game Oriented Drawing:Caricature,Character Design,Still and motion drawings ,story board preparation-content oriented script based. Aero Dynamic Drawing:Product Design oriented and Auto mobile Dynamic Design operation according to science principles

Reference Books

1 Heads, Features and Faces (Dover Anatomy for Artists), George B Bridgman, 5 February 2016, Echo Point Books & Media; Reprint ed..

2 Drawing: A Complete Guide (Art of Drawing), Giovanni Civardi, 10 March 2010, Search Press; Illustrated .

3 The Big Book of Realistic Drawing Secrets: Easy Techniques for drawing people, animals, flowers and nature , Carrie Stuart Parks , 13 June 2009, North Light Books.

4 History of ART, H.W.Jonson, 1st January ,1962, Thames Hudson.

5 Facial Expressions: A Visual Reference for Artists , M.simson, 1June2005, Watson-Guptill Publications .

6 Animator's Survival Kit, Richard E. Williams , 5 November 2009, Faber & Faber.

24AG1205A - DIGITAL MEDIA DESIGN (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG1205A	DIGITAL MEDIA DESIGN	DMG	A	2	0	6	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the basics of design	2	PO5, PO8
CO2	Understanding digital media tools and software	2	PO5, PO8
CO3	Understanding digital images and graphics	2	PO5, PO8
CO4	Applying the basics of design to a web and mobile Interface Design and prepare UI.	3	PO5, PO8
CO5	Analyzing data in any form	4	PO5, PO8
CO6	Creating digital media projects for quality and effectiveness.	6	

Syllabus

High-end image editing and manipulation techniques, Advanced vector graphics and illustration, 3D graphics creation and integration, HDR imaging and advanced color correction

Mastering software like Adobe After Effects, Blender, and Unity Scripting and automation in design software, Advanced workflow and project management techniques, Cross-platform design considerations

Advanced animation techniques and motion graphics, Interactive multimedia applications, Augmented Reality (AR) and Virtual Reality (VR) design, Advanced audio and video editing

Advanced UX/UI principles and techniques, Conducting user research and usability testing, Designing for accessibility and inclusivity, Prototyping and iterative design methodologies

Creating high-dynamic-range (HDR) images. Advanced vector illustration with complex shapes and effects. Developing a 3D model and integrating it into a digital project. Creating a complex animation sequence with After Effects. Advanced video editing and special effects. Building a cross-platform multimedia application. Scripting for automation in design workflows. Conducting a comprehensive usability test and analysis.

Designing and implementing an interactive AR experience, Designing a fully accessible web interface. Developing a VR environment and interactive elements. Advanced prototyping techniques for mobile apps. Implementing user feedback to enhance a digital media project. Analyzing performance metrics and optimizing a digital project. Final project development, presentation, and critique.

Reference Books

1 The Digital Media Handbook , Dewdney A. & Peter R , 2nd Edition , Routledge. Oxon..

2 Digital media and society: An introduction, Athique, A, 2013, John Wiley & Sons.

3 Youth, identity, and digital media , Buckingham, D , 2007 , The MIT Press.

4 The Digital Media Handbook , Dewdney, A., & Ride, P , 2006, Routledge.

5 An introduction to digital media , Feldman, T , 2003 , Routledge..

6 Digital media and society , Lindgren, S, 2017 , Sage.

24AG1206 - VISUAL ANALYSIS TOOLS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG1206	VISUAL ANALYSIS TOOLS	VAT	R	2	1	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction to Semiotic Analysis and Visual Analysis Tools	1	PO1, PO5
CO2	Understand the concepts of Semiotic Systems	2	PO2, PO4
CO3	Applying the concepts of psycho-sexual analysis to media texts	3	PO1, PO3, PO5
CO4	Analyze Media Texts in the framework of Marxist Analysis	3	PO2

Syllabus

Evolution of Information Society, Hunter- Gatherer\'s Society, Agrarian Society. Feudal Society, Industrial Society, Postindustrial Society, Information Society, Knowledge Gap, Visual Sociology, Ocularcentrism, Perception Process, Schemata and its Functions, Cognitive Development and Jean Piaget.

Prologue to Semiotics, Saussure\'s Semiology, Charles Sanders Peirce Semiotics, Semiotic System & Visual Semiotic System, Semiotic Codes, Codes, Modality, Truth Eco, Hyperreality, Syntagmatic Analysis, Paradigmatic Analysis, Intertextuality, Ethnosemiotics, Frames, Visual Metaphor. Psychology, Subjectivity, Objectivity,

Subjectivity, Objectivity, Sexuality: The Oral, The Anal, The Phallic, The Genital; The Unconscious and Motivational Research, Castration Complex, Jocasta Complex, Laius Complex, Oedipus Complex and Oedipus Myth, Phallocentrism, Visual Pleasure, Gaze

- Voyeuristic Gaze, Fetishistic Gaze, Lacanian Gaze, Laura Mulvey and Visual Pleasure Marxist analysis of a Visual, Materialism, Base and Superstructure, Class Conflict, Alienation, The role of Ideology, Feminist approach to visual - Gender Stereotyping, Sexism, Post-Modernism and Visual Analysis

Reference Books

1 Understanding Media The extensions of man , Marshall McLuhan, 1966, Signet.

2 Visual Explanations: Images and Quantities, Evidence and Narrative, Edward R. Tufte, 1997, Graphics Press.

3 The Visual Display of Quantitative Information, Edward R. Tufte, 2001, Graphics Press.

4 Data Points - Visualization That Means Something, Nathan Yau, 2013, John Wiley & Sons Inc.

24AG1207A - MATTE PAINTING (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG1207A	MATTE PAINTING	MPT	A	2	0	6	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Students will describe how matte paintings contribute to the creation of visual effects and environments in movies.	2	PO1
CO2	Understand Explain the process of integrating matte paintings into a film or video production.	2	PO2
CO3	Relate Students will describe how matte paintings contribute to the creation of visual effects and environments in movies.	2	PO2
CO4	Apply Use various digital tools to create basic matte paintings.	3	PO3
CO5	prepare Students will demonstrate the ability to apply layering techniques in Photoshop or other digital painting software to construct a simple matte painting.	3	PO4
CO6	Analyze Use various digital tools to create Advance matte paintings.	4	PO5

Syllabus

Introduction to Matte Painting,History and evolution of matte painting Overview of tools and software (e.g., Photoshop, Nuke) Fundamental principles of matte painting

Understanding Light and Color Principles of lighting and color theory Techniques for creating realistic lighting and shadows Color grading and matching

Digital Tools and Techniques Layering and masking techniques Photo manipulation and integration Use of 3D elements in matte painting

Composition and Perspective Principles of composition in visual storytelling Techniques for achieving correct perspective Creating depth and scale in matte paintings

Advanced Techniques and Portfolio Development Advanced digital painting techniques Integration of matte paintings into live-action footage Developing a professional portfolio

Reference Books

1 D'artiste: Matte Painting 3, David Luong, Damian Mac?, Milan Schere, 1st,2013, Ballistic Publishing.

2 Matte Painting: Creating Photorealistic Environments for Film & TV, David Mattingly , 1st 2011, Focal Press.

3 The Invisible Art: The Legends of Movie Matte Painting, Mark Cotta Vaz, Craig Barron, 1st 2002, Chronicle Books.

4 Digital Matte Painting Essentials, David B. Mattingly, 1st 2011, Course Technology PTR.

24AG2109A - SOUND DESIGN (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG2109A	SOUND DESIGN	SDS	A	0	2	6	0	5

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Analyze the principles of sound design and their application in different media, including film, television, and video games.	4	PO4
CO2	Demonstrate proficiency in using sound design software and tools to create, manipulate, and enhance audio elements.	3	PO5
CO3	Evaluate the effectiveness of soundscapes and audio elements in conveying emotions, themes, and narrative in various media projects.	5	PO6
CO4	Create complex sound designs that integrate dialogue, sound effects, and music to produce a cohesive and immersive auditory experience.	3	PO8

Syllabus

Principles of Sound Design-Fundamentals of sound and acoustics The role of sound in storytelling and emotional impact Historical overview of sound design in various media Key concepts: diegetic vs. non-diegetic sound, sound motifs, and leitmotifs

Sound Design Tools and Techniques-Introduction to sound design software and digital audio workstations (DAWs) Recording techniques: microphones, field recording, and studio setups Sound manipulation: editing, mixing, and processing Foley and sound effects creation

Soundscapes and Audio Elements-Building and layering soundscapes The integration of dialogue, music, and sound effects Sound in different media contexts: film, television, radio, and games Evaluating and critiquing soundscapes for effectiveness

Advanced Sound Design Projects-Advanced techniques in sound manipulation and design Sound design for specific genres (e.g., horror, sci-fi, documentary) The collaborative process in sound design: working with directors, editors, and composers Final project: creating a comprehensive sound design for a media piece

Reference Books

1 Sound design: The expressive power of music, voice, and sound effects in cinema., Sonnenschein, D., 2001, Michael Wiese Productions.

2 Practical art of motion picture sound , Yewdall, D. L. , 2012, Focal Press.

3 The sound effects bible: How to create and record Hollywood style sound effects, Viers, R. , 2012, Michael Wiese Productions .

4 Sound for film and television, Holman, T. (2010), 2010, Focal Press.

24AG2210A - MEDIA MANAGEMENT AND ENTREPREUNERSHIP (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG2210A	MEDIA MANAGEMENT AND ENTREPREUNERSHIP	MME	A	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To understand Process of Management	1	PO1
CO2	To Understand the process of Media business	2	PO2, PO5
CO3	To Analyze the functioning of Electronic media	3	PO3, PO4
CO4	To Analyze Entrepreneurship patterns in media	4	PO4
CO5	Analyze and apply the principles of financial management, including budgeting, revenue generation, and cost control, to enhance the profitability and sustainability of media enterprises.	5	PO2, PO5

Syllabus

Concepts, Function and Process, Nature of Management, Evolution of ManagementThoughts, Early Classical Approaches-Administrative, Bureaucratic and Scientific Approach, Contributionand Limitations of Scientific Management

Neo -Classical Approaches -Human Relations Movement,Behavioral Approach-Douglas, McGregor, Abraham Maslow, Chester Barnard, Mary, Modern Approaches -Quantitative Approach, Contingency Approach

MEDIA AS BUSINESS, MEDIA ECONOMICSOrganization of a Newspaper, Publication, Registration, Newspaper Production, Newspaper Management inIndia, Managerial Function in a Newspaper Organization, Editorial Management, Advertising Management,Circulation, Personnel and Financial Management, Accounting, Printing, Competition

Electronic & DigitalMedia Management CO4 Concept, meaning and definition of an entrepreneur, Theories of entrepreneurship,Factors influencing entrepreneurial development and motivation, Classification and types of entrepreneursMedia start ups, Media Innovation: Elements and Principles.

Marketing and Distribution in Media Marketing Strategies for Media Products Branding and Promotion in the Media Industry Distribution Channels in Media Digital Marketing and Social Media Strategies Audience Analysis and Targeting Monetization Strategies in Media

Reference Books

1 Management of electronic media. Australia: WadsworthCengage Learning., Albarran, 2, Albarran, A. B. (2010).

2 Managing media companies: Harnessing creative value.Chicester: Wiley, Aris, A., & Bughin, J., 2, John Wiley & Sons.

3 Entrepreneurial journalism: How to build whats next for news, Briggs, M, 2, Sage.

4 Media Management: A Casebook Approach, George Sylvie, Jan LeBlanc Wicks, Michael B. Salwen, 5, Routledge.

24AG2211A - POST PRODUCTION TOOLS (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24AG2211A	POST PRODUCTION TOOLS	PPT	A	0	0	8	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic principles of post-production, including video and audio editing, color correction, and visual effects.	1	PO1
CO2	Apply post-production tools and software to edit and enhance video and audio content effectively.	2	PO2
CO3	Analyze the impact of post-production techniques on the overall quality and storytelling of multimedia content.	3	PO3

Syllabus

Introduction to Post-Production Tools: This module introduces students to the fundamental concepts and processes involved in post-production. It covers the basic tools and software used in editing, including non-linear editing (NLE) systems, video and audio editing software, and an overview of the post-production workflow. Students will learn about the importance of organizing media, understanding file formats, and setting up projects in a post-production environment. The module also emphasizes the role of post-production in the overall production process, highlighting how it contributes to storytelling and the final quality of the content.

Video Editing Techniques In this module, students will delve deeper into the art and technique of video editing. They will explore different editing styles, such as continuity editing, montage, and parallel editing. The module includes practical exercises in cutting and trimming clips, adding transitions, and working with multiple layers of video. Students will also learn about color correction and grading to enhance the visual aesthetics of their projects. The module emphasizes the creative decision-making process in editing, encouraging students to experiment with pacing, rhythm, and narrative structure to convey the intended message effectively.

Audio Post-Production This module focuses on the audio aspect of post-production, teaching students the skills needed to edit, mix, and master audio for various types of media. Topics include dialogue editing, sound design, and the use of sound effects and music to enhance the emotional impact of visual content. Students will gain hands-on experience with audio editing software, learning how to synchronize audio with video, clean up noise, and balance sound levels. The module also covers the principles of surround sound and the importance of audio in creating an immersive experience for the audience.

Advanced Post-Production Techniques The final module introduces advanced post-production techniques, including motion graphics, visual effects (VFX), and compositing. Students will learn how to create and integrate visual effects into their projects using industry-standard software. The module also covers the basics of green screen keying, rotoscoping, and 3D compositing. Additionally, students will explore the process of rendering and exporting final projects in different formats suitable for various platforms. This module prepares students to handle complex post-production tasks and equips them with the skills needed to work in professional post-production environments.

Reference Books

1 The Technique of Film and Video Editing: History, Theory, and Practice, Ken Dancyger, 2018, Routledge.

2 Adobe Premiere Pro Classroom in a Book, Maxim Jago, 2021, Adobe Press.

3 Sound Design: The Expressive Power of Music, Voice, and Sound Effects in Cinema, David Sonnenschein, 2021, Michael Wiese Productions.

4 Digital Compositing for Film and Video: Production Workflows and Techniques, Steve Wright, 2020, Focal Press.

24BB1101R - MANAGERIAL ECONOMICS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB1101R	MANAGERIAL ECONOMICS	ME	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply the managerial economics and demand analysis to real-world business scenarios.	3	PO1, PSO3
CO2	Analyse the production function and its relevance in optimizing production processes and the cost-output relationship in both short-run and long-run production settings.	4	PO2
CO3	Analyse the classification of markets, including perfect competition, monopoly, monopolistic competition, and oligopoly and their implications for price and output determination.	4	PO2, PSO3
CO4	Analyse the macroeconomic concepts such as national income, inflation, unemployment, BOP, business cycle, and understand their significance in measuring the economic performance of a nation.	4	PO2, PO9
CO5	Analyse case lets in nature and scope of managerial economics production and cost analysis market classification and macroeconomic concepts	4	PO6, PSO3

Syllabus

NATURE AND SCOPE OF MANAGERIAL ECONOMICS AND DEMAND ANALYSIS Definitions meaning and chief characteristics Scope Law of demand Determinants of demand why demand curve slopes downwards Price elasticity of demand Income elasticity of demand Cross elasticity of demand Techniques of demand forecasting Survey methods Statistical methods

PRODUCTION AND COST ANALYSIS Factors of production Production function The law of diminishing returns Isoquants Cobb-Douglas production function Cost concepts Costoutput relationship in the shortrun and longrun Economies and diseconomies of scale Breakeven analysis

MARKET CLASSIFICATION Classification of market Perfect competition Features Price output determination in short run and long run Monopoly Features Price output determination in short run and long run Monopolistic competition Features Price output determination in short run and long run Oligopoly Features Price output determination

MACRO ECONOMICS Scope National Income Definition Concepts of national income GDP GNP NNP Per Capita Income Methods of measuring national income Inflation Unemployment BOP Business cycle

CASE LETS Case lets in nature and scope of managerial economics production and cost analysis market classification and macroeconomic concepts

Reference Books

1 Managerial Economics, R. L. Varshney and K. L. Maheshwari, 2010, Sultan Chand & Sons, New Delhi..

2 Managerial Economics, D. N. Dwivedi, 2010, Vikas Publishing House Pvt. Ltd., New Delhi..

3 Managerial Economics, P. L. Mehta, 2007, S. Chand & Sons, New Delhi..

4 Managerial Economics, Shankaran, 2006, Margam Publications, Chennai..

5 Managerial Economics, Adhikary, M, 2009, Khosla Publishers..

6 Managerial Economics, H. L. Ahuja, 2008, McGraw Hill..

24BB1102R - PERSPECTIVES OF MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB1102R	PERSPECTIVES OF MANAGEMENT	POM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	After completion of CO1 Syllabus the students will be able to define various fundamental concepts in management studies.	3	PO1, PSO1
CO2	After completion of CO2 Syllabus the students will be able to interpret various aspects in management of organizations	4	PO2
CO3	After completion of CO3 Syllabus the students will be able to make use of various managerial concepts on realtime basis.	3	PO3
CO4	After completion of CO4 Syllabus the students will be able to analyze the relationships between various causes and outcomes at workplace.	4	PO3
CO5	After completion of CO5 Syllabus the students will be able to analyze the relationship between organizations, their social responsibility and leadership activities.	4	PO2

Syllabus

Management: Science Theory and Practice: Introduction: Concept Nature and functions of Management Levels of Management An overview of functional areas of Management Types of managers Managerial roles skills and functions Evolution of Management Theory: Scientific Management approach Behavioral approach Systems approach to Organization Contingency approach

Planning and Organizing: Types of plans Steps in planning Management planning process planning objectives and Characteristics Hierarchies of Planning the concept and techniques of forecasting Decision Making Management by Objectives (MBO) Organizing Meaning Nature and purpose Principles of Organization Importance and principles Departmentalization Span of Control Types of Organization Organizational Structure and Design Line Staff and functional authority Authority and power Line and staff concepts Nature of Line and staff relationships Decentralization of authority Delegation of Authority

Staffing & Directing: Staffing: Meaning Systems approach to staffing sub functions of Staffing Importance of Staffing Recruitment Selection Placement Induction Training and Development Directing Nature of Directing function Principles Importance of Effective Direction Communication Features importance Communication function in organizations Communication process Effective Communication skills for directing Barriers of communication

Co-ordination &Controlling: Coordination Need for co-ordination types of Co-ordination techniques of Coordination Cooperation Supervision Importance Qualities of a good supervisor Essential requirements of effective supervision Management Control process of Management control Requirements of effective control Techniques of Management control Controlling Concept Nature and Importance Essentials of Control Requirements of an Effective Control System Behavioral Implications of Control Techniques of Managerial control

Caselet Analysis on management topics of Planning-Organizing-Staffing-Directing-Controlling

Reference Books

1 Principles of Management, Harold Koontz, Heinz weirich and A Ramachandra Aryasri, 11 th Edition, 2009, New Delhi: Tata-Mc Graw Hills.

2 Principles of Management, P C Tripathi & P N Reddy, 7 th Edition, 2022, New Delhi: Tata-Mc Graw Hills.

4 Management Principles and Application, Dr. C B Gupta, 1st Edition,2016, New Delhi: Mc Graw Hills Publication.

5 Principles of Management, P Subba Rao, 1st Edition, 2009, Himalaya Publishing House.

6 Fundamentals of Management, Stephen P. Robbins and David A. Decenzo, 8 th Edition, 2015, Delhi: Pearson Education.

7 New Era of Management, Richard L. Daft, 11 th Edition,2016, New Delhi: Cengage Learning.

24BB1103R - BUSINESS ENVIRONMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB1103R	BUSINESS ENVIRONMENT	BE	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Outline various components of Business Environment	2	
CO2	Recognize, distinguish, paraphrase, and explain the impact of business environment on business activities and to apply the knowledge to analyze the current situations and take prudent decisions	2	
CO3	Understand regional economic integration, political integration and analyze their impact on business environment	2	
CO4	Analyze the impact of regional economic integration and political integration on international business environment	4	
CO5	Analyze the Significance of Government Policies	2	

Syllabus

CO1: Business environment: Meaning, nature, types of business environment Internal environment, External environment macro, global environment, classification of business, stages of environmental analysis scanning, forecasting, technics of environmental analysis, steps in environmental forecasting, Economic environment Nature of the economy, structure of the economy, economic policies industry, trade, Fiscal, monetary, FEMA.

CO2: Political and government environment: functions of the state, economic roles of government regulatory, entrepreneurial promotional role, planning role. Technological environment innovation, technology and competitive advantage, sources of technological dynamics- IT revolution of business environment, ICT & Marketing.

CO3: Socio cultural environment: Business and society, business and culture, nature of culture, levels of culture, socio cultural factors and their impact on business, women and business opportunities, child labour, consumerism, Rural development, projects and people, social audit, Corporate social responsibility CSR

CO4: Global environment WTO, globalization of business, features of current globalization, essential conditions for globalization, foreign market entry strategies, Multi National Corporations MNCs Nature of MNCs, merits of MNCs and demerits of MNCs, Global fortune 500 companies, fortune 500 Indian companies

C05: Economic Environment of Business: Significance and Elements of Economic Environment Economic Systems Economic Planning in India NITI AYOG and its importance Government Policies Foreign Trade Policy Demonetization.

Reference Books

1 Business Environment Text and cases, Francis Cherunilam, Revised Edition 2019, Himalaya publishing house, New Delhi .

2 Business Environment, Shaik Saleem, 2, Pearson.

3 Business Environment, Fernando, 1, Pearson.

4 International Business Environment & Operations , John D Daniel et.al.,, 14, Pearson .

24BB1204R - ORGANIZATIONAL BEHAVIOUR (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB1204R	ORGANIZATIONAL BEHAVIOUR	OB	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To demonstrate the applicability of organizational behaviorconcepts to understand the individual behavior in the organization	2	PO8, PSO2
CO2	To analyze the complexitiesassociated with management of individual behavior in the organization.	4	PO8, PO9, PSO2
CO3	To analyze the complexities associated with management of groupbehavior in the organization	4	PO3, PO8, PO9, PSO2
CO4	To analyze the facets of organizational culture and manageorganizational change and work stress	4	PO3, PO8, PO9, PSO2
CO5	Test of NPTEL Examination MCQs followed by assessments	3	PO3, PO8, PO9, PSO2

Syllabus

Organizational Behavior Nature and Significance of OB Contributing Disciplines to the OB field Challenges and Opportunities for OB Developing an OB Model, Personality Determinants of personality, The Big Five Model, Major personality attributes influencing OB Emotions Emotions and Moods, Emotional Labour Emotional Intelligence, Values Types of Values, Attitudes Types of Attitudes, work related attitudes

Learning Theories of learning Learning and OB, Perception Perceptual process Perceptual errors, Improving perception, Motivation Hierarchy of Needs Theory, Two-FactorTheory Expectancy theory, Applications of Motivation

Foundations of Group Behavior: Groups Types of groups Stages of Group Development Groups and Teams, Communication Communication Process Directions of Communication, Barriers to Effective Communication, Leadership Styles Theories of Leadership Trait, Behavioral and Contingency theories, Power & Politics Bases of Power, Organizationalpolitics, Conflict The Conflict process Managing conflict

Organizational Culture: Functions, creating and sustaining organizational culture, Organizational Change, Forces for change Resistance to change Approaches to Managing Organizational Change, Organization Development Techniques, Work Stress Causes and Consequences of Stress, Stress Management Techniques

Reference Books

1 Organizational Behavior, Robbins, Stephen, P., Timothy A Judge & Niharika Vohra, 14, Pearson.

2 Organizational Behavior:An Evidence Based Approach, Fred Luthans, 12, Mc.Graw Hill,.

3 Organizational Behavior, Aswathappa, 3, Himalaya.

4 Organizational Behavior: A Skill-Building Approach, Christopher P. Neck, Jeffery D. Houghton, and Emma L. Murray, 2, Sage.

24BB1205R - HUMAN RESOURCE MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB1205R	HUMAN RESOURCE MANAGEMENT	HRM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basics of HRM and integrated perspective on role of HRM in modern business.	2	PO6
CO2	Understand the planning of human resources and gain competency to recruit employees.	2	PO5
CO3	Apply the skills on training and appraising the performance of employees.	3	PO7
CO4	Apply the knowledge on compensation and salary administration and handling employee issues.	3	PO7, PSO2
CO5	Analyze the real-time scenario of HRM in industries	4	PO7

Syllabus

Introduction: Meaning and Definition, Importance of HRM, Functions of HRM, Nature & Scope of HRM, Objectives of HRM, Challenges of Human Resource Management; Personnel management vs Human Resource Management.

Manpower planning: objectives, importance, process; Job Analysis: Job Description, Job specification, uses of job analysis; Job design: Techniques of Job design; Employee Recruitment: sources of recruitment, methods of recruitment; Selection: process of selection, Types of interviews, Interview Tests; Placement and Induction, Transfer, Promotion and Separation

Training and Development: Training vs Development, methods of training: on-the job and off- the job methods; Performance Appraisal: process of performance appraisal, methods of appraisal, Errors in appraisal, Job evaluation: Methods of job evaluation; Employee Compensation: Objectives of compensation, Components of compensation; Employee Benefits, Employee Welfare and Safety.

Employee Grievances, Employee Discipline, Industrial Relations, Trade Unionism, Collective Bargaining, Managing Ethical issues in HRM, HR audit and Evaluation, International HRM, eHRM, HRIS, Recent trends in HRM: Managing Diversity, Downsizing, Contingent workforce, Tele commuting, Competency Mapping, Talent Management.

Real time case studies in manpower planning, Recruitment, Industrial relations, Employee Grievances, Trade unionism, Managing turnover, Career Management.

Reference Books

1 Human Resource Management, Dessler, 2019, Pearson Education.

2 Human Resource Management, Raymond Andrew Noe, John R. Hollenbeck, Barry Gerhart, Patrick M Wright, 2014, The McGraw Hill Pub.

3 Managing Human Resources, Louis &Gomitz Mejia, 2010, Pearson Education.

4 Human Resource Management Text and Cases, Aswathappa K, 2020, Tata McGraw Hill Pub.

24BB2108R - FUNDAMENTALS OF DIGITAL MARKETING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB2108R	FUNDAMENTALS OF DIGITAL MARKETING	DM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Outline the key concepts of digital marketing.	2	PO1
CO2	Apply the SEO to a website	3	PO4
CO3	Use the key PPC concepts to draw visitors	3	PO6
CO4	Use Campaign Management to manage the marketing concepts	4	PO2
CO5	Application of Digital Marketing practices for career advancement	4	PO3

Syllabus

Key Concepts of Digital Marketing: Fundamental, Need, Scope of Digital marketing, Traditional v. Digital Marketing, the Opportunity of Digital Marketing, Characteristics of Digital Marketing, Implications of Digital Marketing, Digital marketing framework delivering enhanced customer value, market opportunity analysis and digital services development, ASCOR digital marketing framework, Application of digital marketing, critical success factor for digital marketing

Digital marketing communication and channel mix: Designing the communications mix, Marketing communications, steps to creating marketing communication strategy, developing communications messaging, communication mix across digital channels. Introduction to digital marketing channels- Search marketing, Display marketing, social media marketing, Partner, direct, content and platform based marketing channels

Components of digital marketing- Website marketing, Search engine marketing, online marketing, email marketing, blog marketing, social media marketing, Audio video and interactive marketing, mobile marketing, public relations, multimedia marketing.

Digital Business Present and future- Digital marketing ,The Indian view, India digital spend overview , India digital advertising spend, key digital advertising trends in India, India Digital marketing/tools landscape, Digital marketing emerging trends and concepts, Big data and IoT, B2B and SMB, SoLoMo. Career in Digital Marketing- Emerging opportunities for digital marketing professionals, The changing role of CMO in Organisations, Building a career in Digital marketing, Top Digital marketing areas as career tracks, Approaching a career in digital marketing.

Career in Digital Marketing- Emerging opportunities for digital marketing professionals,The changing role of CMO in Organisations, Building a career in Digital marketing, Top Digital marketing areas as career tracks, Approaching a career in digital marketing.

Reference Books

1. Digital Marketing Strategy: An Integrated Approach to Online Marketing , Simon Kingsnorth , 2nd Edition , Kogan Page.
2. Fundamentals of Digital Marketing, Puneet Singh Bhatia , 1st Edition , Pearson Education .
3. Digital Marketing Essentials , Jeff Larson, Stuart Draper , 2nd Edition , Stukent .
4. Digital Marketing: Strategy, Implementation and Practice , Dave Chaffey, Fiona Ellis-Chadwick , 7th Edition , Pearson Education .

24BB2109R - PRODUCTION & OPERATIONS MANAGEMENT (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24BB2109R	PRODUCTION & OPERATIONS MANAGEMENT	PROM	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basics and general concepts of production and operations management in decision making	2	PO1
CO2	identify methods for maximizing productivity, attaining high levels of production capacity by applying various strategies of location and layout planning	3	PO1
CO3	Organize the usage of resources which include people, plant, equipment, tools, inventory, premises and information systems	3	PO1
CO4	Analyze the applicability of the Quality management concepts and ensure the best qualitative operational efficiency in the organization	4	PO1
CO5	Analyze the applicability contemporary issues in production and operations, six sigma, Demings principle in the organization	4	PO1

Syllabus

Introduction to Production and Operations Management, Features of Production and Operation management , Decision making in production

Production Planning, New Product Design, Factors influencing product design, Approaches to product design, Product Development Process, Aggregate Capacity Planning

Process and project management, Major process decisions, Work Measurement Techniques, Work Study, Time Study

Project planning and control , Scheduling techniques : Gantt, PERT, CPM.

Contemporary issues in production and operations, six sigma, Demings principles.

Reference Books

1 Productions and Operations management , Everett.E, Adam, Jr. Ronald.J.Ebert, 4, 2000, TMH.

2 Production and Operations Management, S.N.Chary,, 2, 2009, TMH.

3 Operations Management, William Stevenson, 1, 2009, TMH.

4 Operations Management, K. Sridhara Bhat, 1, 2009, HPH.

24CA1101 - COMPUTER ORGANIZATION (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1101	COMPUTER ORGANIZATION	CO	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the fundamental concepts and techniques used in digital electronics and using K-Maps for Boolean Expression simplification	2	PO1, PO3
CO2	Model the building blocks of Combinational and Sequential circuits and explaining registers and its usage	3	PO1, PO3
CO3	Analyze the basic concepts of computer organization: structure and operation of computers and their peripherals the design of the functional units of a digital computer system.	4	PO1, PO3
CO4	Classify the working of the Central Processing Unit. Design and evaluate the performance of memory systems	4	PO1, PO3

Syllabus

Number Systems and Boolean Algebra Number Systems cover representing numbers in various radices, radix conversions, and different integer formats (unsigned, signed, sign magnitude, 1\\'s and 2\\'s complement). Boolean Algebra includes logic gates (OR, AND, NOR, NAND, XOR, XNOR), truth tables, De Morgan\\'s theorem, Boolean laws, and circuit design using Karnaugh Maps for minimization techniques (SOP, POS). Combinational Building Blocks focus on adders and subtractors.

Digital Circuits and Computer Architecture Digital Circuits include multiplexers and decoders, and sequential circuits featuring various flip-flops (SR, JK, D, T). Basic Structure of Computers covers computer types and functional units. Register Transfer and Micro-Operations involve register transfer language, bus and memory transfers, and different types of micro-operations (arithmetic, logic, shift).

Basic Computer Organization and Design Basic Computer Organization and Design covers computer codes, registers, and instructions, along with timing and control methods (hardwired and microprogrammed). It includes the instruction cycle, memory-reference instructions, I/O operations, interrupts, and designing basic computers and accumulator logic. The microprogrammed control unit focuses on address sequencing and microprogram examples, with an overview of the Central Processing Unit (CPU).

Computer Architecture Components include General Register Organization, various Stack types, Instruction Formats, Addressing Modes for data transfer and manipulation, and Program Control. It also covers concepts in Reduced Instruction Set Computer (RISC). Memory Organization encompasses Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, and Virtual Memory systems, focusing on their roles in data storage and retrieval efficiency.

Reference Books

1 Computer Organization and Design, David A. Patterson, John L. Hennessy, 2012, Morgan Kaufmann.

2 Computer Organization, Carl Ham Acher, 2012, Tata McGraw Hill.

3 Computer Architecture, John L. Hennessy, David A. Patterson, 2016, Morgan Kaufmann.

4 Structured Computer Organization, Andrew S. Tanenbaum, Todd Austin, 2015, Pearson.

5 Computer Organization and Embedded Systems, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, 2010, McGraw-Hill Education.

24CA1102 - ESSENTIALS OF INFORMATION TECHNOLOGY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1102	ESSENTIALS OF INFORMATION TECHNOLOGY	EIT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Illustrate the basic building blocks of computers (hardware), system software, and essential programming concepts for problem solving.	2	PO1, PO3
CO2	Understand various basic concepts of creating, formatting, and collaborating on documents in MS Word.	2	PO1, PO2, PO4
CO3	Apply the concepts of Microsoft PowerPoint for building presentations with slides, layouts, visuals, animations, and speaker notes for effective delivery.	3	PO1, PO3
CO4	Examine the basic and advanced functions in Microsoft Excel for data manipulation, analysis, and presentation.	4	PO1, PO2, PO4
CO5	Evaluate and Explore data through Word Processing, Spreadsheet applications and Presentations.	5	PO2, PO4

Syllabus

Fundamentals of Computers, block diagram of Computer, Central Processing Unit (CPU), Memory, Input/output devices. System Software types, Programming Essentials: Problem solving with algorithms, flowchart, Programming styles, Programming Fundamentals.

interface overview, Creating new documents and working with templates, Text formatting (font, size, color, alignment), Paragraph formatting (indentation, spacing, line breaks), Working with styles and themes, Inserting and editing images, tables, and charts, Checking spelling and grammar, Page layout and formatting (margins, headers, footers), Collaboration features (sharing documents, track changes), Mail Merge (Creating personalized letters and

Introduction to PowerPoint and presentation creation, designing slides with layouts, themes, and backgrounds, Adding text, images, videos, and audio to slides, Working with transitions and animations, Creating charts and graphs, delivering presentations with speaker notes and handouts.

Basic Functions: Basic Math & Percentages, Statistics, Conditional Logic, lookup & Reference,Text Manipulation,Logical Operations ,Date & Time Advanced Functions, Pivot Tables, Financial Functions, Data Analysis, Data Manipulation

Evaluate and Explore data through Word Processing, Spreadsheet applications and Presentations - planning to do lab on word, excel, power point from basic to advancd level

Reference Books

1 Computer Systems: A Programmer's Perspective , Randal E. Bryant, David R. O'Hallaron , 2105, Pearson .

2 Computer Organization and Design: The Hardware/Software Interface , David A. Patterson, John L. Hennessy , 2017, Morgan Kaufmann .

3 Microsoft Office 365 & Office 2019 Introductory , David W. Beskeen, Steven M. Freund, Joy L. Starks , 2019, Cengage Learning .

4 Microsoft PowerPoint 2019 Step by Step , Joan Lambert , 2019, Microsoft Press .

5 Excel 2019 Bible , Michael Alexander, Richard Kusleika , 2019, Wiley .

24CA1103R - COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1103R	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	CTSD	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand different concepts of C programming constructs for creating programs.	2	PO1, PO5
CO2	Illustrate different control structures and Arrays.	2	PO1, PO2
CO3	Experiment with functions and pointers for solving real world problems.	3	PO2, PO4
CO4	Analyze the working of structures and different file handling methods	4	PO4, PO5
CO5	Evaluate solutions for programs using basic and advanced concepts of C language .	5	PO2, PO5

Syllabus

Overview of Programming: Introduction, Program design and implementation, Flowcharts & Algorithms, Types of Programming Languages, Assemblers, Compilers, Interpreters. Fundamentals of C programming: Overview of C, Data Types, Constants & Variables, Operators & Expressions. Basic I/O-formatted and Unformatted I/O, Type modifiers ,Type casting, type conversion.

Decision Making-Branching & Looping: Decision making with IF statement, switch statement, While statement, do-while statement, for statement, Jump Statements. Arrays : Concepts, Using array in C, One dimensional array, two dimensional array, multi-dimensional array. Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions

User-defined Functions: Purpose of functions, Definition, types, Structure of User-defined Functions, Return Values, Categories of User-defined Functions, Passing Arrays to Functions, argc and argv, Recursion, The Scope, Visibility and Lifetime of variables. Pointers: Introduction, Declaring Pointer Variables, Initialization of Pointer variables, accessing Variables, Pointer expression and Arithmetic , pointer to pointers, dynamic memory allocation, storage class specifiers.

Enumerated, Structure, and Union: The Type Definition or Type def, Enumerated Types, Structure Introduction, Defining a structure, declaring structure variables, accessing structure members, structure initialization, nested structures, array of structures, passing structures to functions, Unions. Additional features: File Handling Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files, C Preprocessor commands, Conditional compilation directives, C standard library and header files.

Reference Books

1 The C programming Language by Richie and Kenninghan, 2004, Brian W. Kernighan Dennis M. Ritchie , 1988, BPB .

2 Programming in ANSI C , Balaguruswamy , 2017, Tata McGraw Hill. .

3 Let us C , Yashwant Kanetkar , 2017, BPB.

4 Programming in C , Reema Thereja , 2016, Cengage .

5 programming in c a practical approach , ajay mittal , 2010, Pearson Education India .

24CA1204R - ESSENTIALS OF OPERATING SYSTEM (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1204R	ESSENTIALS OF OPERATING SYSTEM	EOS	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Discuss Operating System Functionalities, Types of Operating Systems, Computer Architecture support to Operating Systems.	2	PO1, PO2, PO3, PSO1
CO2	Explain the Process and CPU scheduling.	2	PO3, PO4, PO5, PSO1
CO3	Demonstrate Process Synchronization, and Deadlocks	3	PO2, PO3, PO4, PSO1
CO4	Illustrate Memory management, Fragmentation and file system	3	PO2, PO3, PO4, PSO1

Syllabus

What is an OS, Brief history, Functionalities of OS,. Basics Computer System Architecture overview. Operating System Structures, Types of Different OS, Basic Oss: Batch, Multi-programmed batch, Timesharing, Real-Time OS (RTOS), Distributed OS.

Processes: Definition, Process States, 5 state model, Process structure: PCB and components, Interprocess Communication, Operations on Processes, Threads, CPU Scheduling: I/O burst cycle, Context Switching, Short Term, Long Term and Scheduling Criteria, Algorithms: First Come First Serve, Shortest Job First, Priority Scheduling, Round Robin.

Process Synchronization: Critical Section Problem, Mutual Exclusion, Races, Semaphores, Classic Synchronization Problems, Readers/Writers, Dining Philosophers. Deadlocks: Deadlocks and Starvation, System Model, Necessary Conditions for a deadlock, Mutual Exclusion, Hold and Wait, No Pre-emption, Circular wait, Resource Allocation Graphs, Handling Deadlocks, Prevention, Avoidance, Bankers Algorithm.. I/O Device Management, I/O Device Types and Characteristics.

Memory Management: Swapping, Multiple Partition-First Fit-Best Fit-Worst Fit, RAID and Data Redundancy. Fragmentation: Internal and External Fragmentation, Paging and Demand Paging, Page Replacement, Page Replacement Algorithms, Thrashing. File-System: File-System structure, Access Methods, Directory structure, File-System Implementation, Protection.

Reference Books

1 Operating System Concepts, Abraham Silberschatz, Greg Gagne, and Peter Baer Galvin, 2017, Pearson Education.

2 Modern Operating Systems, Andrew S. Tanenbaum and Herbert Bos, 2014, Pearson Education.

3 Linux Kernel Development , Robert Love , 2010, Addison-Wesley Professiona .

4 Windows Internals , Mark Russinovich, David A. Solomon, Alex Ionescu , 2012, Microsoft Press .

24CA1205R - DATA STRUCTURES (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1205R	DATA STRUCTURES	DS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the fundamental data structures, is crucial for designing efficient algorithms and solving complex problems in computer science.	2	PO1, PO2
CO2	Apply the Basic operations sorting, searching, insertion and deletion of data for arrays and linked list . Stacks and queues are essential building blocks in computer science, providing structured ways to organize data based on specific access patterns.	3	PO1, PO2, PO3, PO4
CO3	Analyze real time problems and design solutions using Trees and Graphs. Trees and graphs are fundamental data structures that excel at representing hierarchical and network relationships between elements.	4	PO2, PO3
CO4	Analyze the strengths and weaknesses of different searching and sorting techniques, you can select the most appropriate algorithm for your specific needs, leading to efficient and well-performing software solutions	4	PO1, PO2, PO4
CO5	Evaluating programs to demonstrate the functionality of different data structures, sorting algorithms, searching algorithms, etc.	5	PO1, PO2, PO4

Syllabus

Introduction to Data structures: Definition, Classification of data structures, Time and space complexity, Static and Dynamic memory management, Dynamic Memory allocation functions. Pointers ,Array and its type. Linked List: Definition, Representation, Types of linked lists, creation, insertion, deletion, search and display

Stack and Queue: Stack Definition, Array Operations on stack: PUSH, POP, peek Applications of stacks Infix, prefix and postfix notations and recursion. Queue: Definition, enqueue and dequeue operation, Types of queue: Simple queue, Circular queue, Double ended queue (deque),Priority queue, Application of queue

Trees and Graph: Definition, Binary tree and its terminology, Traversal of Binary Tree, Binary search tree, AVL Tree, Graphs: Definition, Graph terminology, Depth First search, Breadth First search, Application of Graphs.

Searching and Sorting: Sequential and binary search. Sort: Classification of sorting technique Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Heap sort.

Reference Books

1 Data Structures Through C-4TH Edition:Learn the Fundamentals of Dta Structures ThrouGh C, Yashvanth Kanetkar, 2022, BPB Publications.

2 Data Structures, E. Balagurusamy, 2017, McGraw Hill Education.

3 Data structures, Tata McGraw-Hill, 2017, McGraw Hill Education.

4 Algorithms II, Robert Sedgewick and Kevin Wayne, 2014, Pearson Education.

24CA1206R - DATABASE MANAGEMENT SYSTEMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1206R	DATABASE MANAGEMENT SYSTEMS	DBMS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding Database and File System and Applying different kinds of data models with functional components of DBMS	2	PO1
CO2	Applying design, SQL, PL/SQL and corelating appropriate strategies for optimization of queries with Tuple Relational Calculus and Domain Relational Calculus	3	PO2, PO3
CO3	Analysing normal forms based on functional dependency and Apply normalization techniques to eliminate redundancy with the ACID properties	4	PO1, PO3
CO5	Analysing and apply in Identifying variety of methods for effective processing of given queries	4	PO3, PO5
CO6	Implement SQL queries and PL/SQL programs to do various operations on data.	5	PO3, PO5

Syllabus

In-depth understanding of Database Management Systems (DBMS) and their characteristics, advantages, and various types. Database environments, user roles, and DBMS architecture, emphasizing data independence and interaction through various languages, tools, and interfaces. Data modeling with a focus on the Entity-Relationship (ER) model, including notation, constraints, and relationship types. Explores advanced topics such as the Enhanced ER (EER) model, ensuring comprehensive knowledge in designing and managing databases. Practical applications and considerations in ER and EER diagrams are highlighted for real-world database design.

The Relational Model, covering core concepts, constraints, and schema design. How to convert ER models to relational schemas and gain proficiency in SQL for data definition, manipulation, and complex querying. Topics include relational algebra, creating tables, data types, constraints, and advanced SQL features like nested subqueries, joins, views, and triggers. Practical database design guidelines ensure robust, scalable, and secure databases. Enhanced learning through user-defined functions, procedures, and cursors.

Concept of normalization, including First, Second, and Third Normal Forms, BCNF, and higher normal forms with multi-value and join dependencies. It explores decomposition algorithms for effective normalization. It also explores about file and storage structures, including file storage techniques, index structures, indexing, hashing, query processing and optimization strategies for efficient data retrieval.

Focuses on transaction management, covers transaction processing issues, states, and challenges in handling multiple transactions. It examines ACID properties, system logs, and concurrency control techniques such as lock-based, timestamp-based, and multiversion techniques. Students will learn recovery techniques, including shadow paging and ARIES, to ensure data integrity and consistency in database systems.

Reference Books

1 Database System Concepts, Abraham Silberschatz, Yale University Henry, F. Korth Lehigh University, S. Sudarshan Indian Institute of Technology, Bombay., 1991, Tata McGraw hill books.

2 Fundamentals of Database Systems, Ramez Elmasri, University of Texas at Arlington, Shamkant B. Navathe, University of Texas at Arlington, 2011, Pearson.

4 Principles of Database Systems, Jeffrey D. Ullman , 2014, Galgotia Publications.

5 Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 2014, Tata McGraw Hill..

24CA2107R - DESIGN AND ANALYSIS OF ALGORITHMS (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA2107R	DESIGN AND ANALYSIS OF ALGORITHMS	DAA	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of algorithmic problem-solving, including techniques such as divide and conquer, and recognize their significance in solving computational problems efficiently.	2	PO1, PO5, PO8
CO2	Apply and evaluate the applicability of the Greedy Method to different types of optimization problems, including the Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, and Optimal Merge Patterns.	3	PO1, PO5, PSO1
CO3	Develop proficiency in formulating dynamic programming solutions by breaking down complex problems into smaller subproblems, solving them recursively, and storing intermediate results to avoid redundant computations.	3	PO1, PO8, PSO1
CO4	Analyse the relationship between backtracking and other algorithmic paradigms, such as dynamic programming and branch and bound, understanding when each approach is most suitable for solving optimization problems.	4	PO5, PO8, PSO1

Syllabus

Introduction: Fundamentals of algorithmic problem solving , Performance Analysis: Space complexity, Time complexity ,Growth of Functions: Asymptotic Notation, Big oh notation, Omega notation, Theta notation. Divide and Conquer: Divide and conquer: General method, applications search, Quick sort, Merge sort, Finding the Maximum and Minimum.

Graph Algorithms Graph representations. Traversal algorithms Depth first search and Breadth first search.Greedy method The General Method, Knapsack Problem,Job Sequencing with Deadlines, Minimum cost Spanning Trees, Prims Algorithm, Kruskals Algorithms, Optimal Merge Patterns, Single Source Shortest Paths.

Sorting and Searching: Sorting algorithms: Insertion sort, Bubble sort, Searching algorithms: Linear search, Binary search. Dynamic Programming: General method, applications-, Optimal binary search trees, 0/1knapsack problem, All pairs shortest path problem, Travelling salesperson problem, Reliability design.

Backtracking: General method, applications-n-queen problem, sum of subsets problem, Graph colouring. knapsack problem. Branch and Bound: General method, applications - Travelling salesperson problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution

Reference Books

1 Fundamentals of Computer Algorithms, , Ellis Horowitz, SatrajSahni and Rajasekaran, , 2008, University press.

2 Introduction to The Design and Analysis of Algorithms, Anany Levitin, , 2017., Pearson Education.

3 Introduction to Algorithms, T.H.Cormen, C.E.Leiserson, R.L. Rivest, and C.Stein,, 2022, Pearson Education .

4 Design and Analysis of algorithms, Aho, Ullman and Hopcroft, 1974, Pearson education..

5 Algorithms, Richard Johnson Baugh and Marcus Schaefer, 2003, Pearson Education..

6 Probability and Computing: Randomized Algorithms and Probabilistic Proofs, Mitzenmacher and Upfal., 2005, Cambridge University Press.

24SDAG03 - DIGITAL ART (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDAG03	DIGITAL ART	DTA	R	0	0	4	4	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the recognition and comprehension of art movements	2	PO1
CO2	Understanding cultural and regional styles, technical developments, aesthetics, visual content and industrial design.	2	PO2
CO3	Applying basic design principles to draw 2-D designs	3	PO3
CO4	Analyzing the 3-D design, aesthetics and color dynamics.	3	PO4
CO5	Evaluate the 3-D design, aesthetics and color dynamics.	4	PO5

Syllabus

Fundamental concepts of digital art and its history. Overview of digital tools and software used in creating digital art. Basic digital art techniques, such as brushwork, layers, and color selection. Understanding the evolution of digital art and its value

In-depth exploration of design principles and elements. Introduction to digital illustration and graphic design. Basic animation and motion graphics techniques. Introduction to typography and its role in digital design.

Application of intermediate-level digital art techniques. Compositing and advanced layer manipulation

Applying digital art skills to real-world projects. Collaborative digital art projects and teamwork. Developing a portfolio showcasing a variety of digital art skills. Understanding the professional aspects of digital art

Advanced digital art techniques and tools. Specialization in specific areas like digital painting, 3D modelling, or digital animation. Preparing for a career in digital art, including networking and job-seeking skills. Final project or capstone to demonstrate mastery of digital art skills.

Reference Books

1 Procreate for Artists & Illustrators, Nicholas Zakas, 1st, Nicholas Zakas.

2 A Guide for the Realist Painter, James Gurney, 1st, James Gurney.

3 The Animator's Survival Kit, Richard Williams, 2ND, Richard Williams.

4 The Adobe Illustrator WOW, Sharon Steuer, 2ND, Sharon Steuer.

24SDBB01A - IT FOR BUSINESS MANAGERS & MIS (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDBB01A	IT FOR BUSINESS MANAGERS & MIS	ITBM MIS	A	2	0	0	8	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic use of computer hardware and software, and the Internet in the workplace and apply the acquired skills and concepts in the professional assignments	2	
CO2	Apply the knowledge of networks for effective business operations expansions and manage and analyze business communication with effective use of Word	3	
CO3	Create business databases and dashboards using MS-Excel and examine the business operations using MS-Office application soft wares	4	
CO4	Understand the role of MIS Impact of the Management Information System and the use	3	
CO5	Understand DSS techniques for making effective decisions	3	
CO6	Applying Using data analytics tools for informed decision-making	4	

Syllabus

INTRODUCTION TO COMPUTERS- Overview: Generations of Computer, Definition, characteristics, advantages and disadvantages of computer, Computers for Individual users, Computers for organizations, Computers in society; Components of a Computer-Hardware: Processing Devices, Memory Devices, Input/Output Devices, Storage Devices. Software: System software, Application Software.

Concepts of Internet- the Internet, Intranet, Applications of Internet, Services provided by Internet. E-Commerce-Definition, Goals of E-Business, Characteristics, Categories of E- Business, E-Business Security Issues, advantages, and disadvantages of E-Business. Introduction to Word Processing: Identifying the components of document window, Standard & Formatting Toolbars, Create, Open, save documents, Editing Text in Documents; Viewing & Formatting Documents, Mail Merge.

MS-Power Point - Creating & Opening presentations, slide layout, animation schemes to slides. MS-EXCEL: Insert and delete columns or rows, adjust row height and column width, insert headers and footers, using range names: Creating, sorting, and filtering lists/tables of data, Change sort order. Number formatting: Creating custom formats, charts: Line chart, column chart, bar chart, pie chart, Smart art: List, Process, Cycle, Functions: Mathematical, Text etc. Introduction to Date & Time Functions, Dates, and times: How date and time are stored, Useful date/time functions, Formatting dates and times. Create custom conditional formatting rules, create conditional formatting rules that use formulas, Manage conditional formatting rules.

Management Information System in a Digital Firm MIS Concepts MIS Definition, Role of MIS Impact of the Management Information System MIS and the user MIS A support to the management Management Effectiveness and MIS MIS for a Digital Firm

Simons Model Business Intelligence Decision support systems and knowledge Management Group Decision Support System GDSS DSS Applications in E enterprise Knowledge Management Systems Knowledge Based Expert System KBES MIS and the benefits of DSS

Data Analytics for Business: Business intelligence and data warehousing concepts, Data visualization techniques for storytelling with data, Emerging technologies: Cloud computing, Big Data, Artificial Intelligence (AI), Blockchain, Introduction to data mining and predictive analytics techniques, Using data analytics tools for informed decision-making.

Reference Books

1 Information Technology for Management, Ramesh Behl, 3rd, 2021, Tata McGraw Hill Pvt Ltd.

2 Introduction to Computers with MS-Office 2000, Alexis Leon & Mathews Leon, 7th, 2001, Tata McGraw Hill.

3 Management Information System, G.V. Satya Sekhar, 4th, 2007, Excel Books.

4 Introduction to Computers, Peter Norton, 6th, 2008, Tata McGraw Hill.

5 Management Information System, Javadekar, 7th,2021, Tata MC Graw Hill.

24SDCA03A - WEB DEVELOPMENT USING PYTHON (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDCA03A	WEB DEVELOPMENT USING PYTHON	WDP	A	2	0	2	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic programming skills in core Python	2	PO1, PO2, PO5
CO2	Apply the advanced modules in Python to build Object Oriented Applications	3	PO1, PO2, PO5
CO3	Build python application to connect with the database and perform MongoDB CRUD operations	3	PO1, PO2, PO5
CO4	Analyze Web forms and Application in Python using Django Framework	4	PO1, PO2, PO5
CO5	Create Advanced Frameworks and Tools in Python using Flask, FastAPI.	4	PO1, PO2, PO5
CO6	Evaluating Web Applications in Python using Django Framework	5	
CO7	Evaluating Advanced Frameworks and Tools using Flask, FastAPI.	5	

Syllabus

Python Environment provides a comprehensive overview of the languages history and development, highlighting its evolution and widespread adoption. It covers fundamental concepts including syntax, comments, variables, and data types such as booleans, along with operators for performing operations. Students will learn about essential data structures like lists, tuples, sets, and dictionaries, and how to utilize them effectively. The course also delves into control flow mechanisms such as conditional and iterative statements, enabling learners to create structured and efficient code. Additionally, it introduces functions and lambda expressions, culminating in a solid foundation for understanding Pythons capabilities and applications in various programming scenarios.

Advanced Python covers classes/objects, inheritance, scope, modules, date manipulation, mathematical operations, JSON handling, regular expressions, PIP for package management, exception handling, user input processing, string formatting, dictionaries, file operations, and key libraries like SciPy, NumPy, Scikit-learn, and matplotlib for scientific computing and data visualization.

Web Applications in Python introduces foundational web concepts, covering key terms, client-server architecture, and Pythons integration with SQLite and MySQL databases. Students will learn to access and manipulate data from relational databases and perform MongoDB CRUD operations, essential for building dynamic and scalable web applications using Python.

Django web application framework explores its robust features and characteristics, focusing on installation within a virtual environment, project creation phases, app structure setup, and utilization of Djangos ADMIN interface and console. To create views, map URLs, integrate the template system, work with models for database interaction, manage page redirections, set up emails, process forms, and handle static and media files. Advanced topics include pagination, page restrictions via decorators, cookies, sessions, caching, database migrations, and deployment on free web hosting domains, enabling students to build scalable and efficient web applications using Django.

Explore Flasks advanced capabilities, including Blueprint architecture for modular design, custom extensions for added functionalities, and advanced routing techniques. Delve into FastAPI for creating high-performance APIs with asynchronous capabilities, focusing on asynchronous request handling, effective dependency injection, and managing background tasks. This module aims to equip with the skills to build robust, scalable, and efficient web applications and APIs using these modern frameworks.

Reference Books

1 Python Cookbook, David Beazley and Brian K. Jones., 2013,Third edition, O'Reilly Media.

2 Mastering Django, Nigel George , 2016, Packt Publishing.

3 Fluent Python: Clear, Concise, and Effective Programming, Luciano Ramalho, Second edition, 2022, O'Reilly Media.

4 Core Python Programming, R. Nageswara Rao, 2nd edition, 2018, Wiley Publisher.

5 Django for Beginners: Build Websites with Python & Django, William S Vincent, Volume 1, 2018, Amazon Digital Services LLC.

6 Flask Web Development: Developing Web Applications with Python, Miguel Grinberg, 2018 (2nd Edition), O'Reilly Media.

7 FastAPI: Modern Python Web Development", William S. Vincent, 2020, Independently published.

24SDCM02A - ACCOUNTING INFORMATION SYSTEM (A)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDCM02A	ACCOUNTING INFORMATION SYSTEM	AIS	A	3	0	0	4	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To Understand Basic Accounting Principles	2	PO1
CO2	Mastering Tally Interface and Creating and Managing Company Data.	2	PO1
CO3	To Understand the process of recording various types of financial transactions in Tally	2	PO3, PSO3
CO4	To Gain proficiency in managing inventory within Tally, including creating and maintaining stock items, recording stock transactions, and managing stock levels.	3	PO3
CO5	To Understand how Tally can be used for handling various taxation aspects, including Goods and Services Tax (GST) or other applicable taxes in your region.	3	PO5
CO6	After successfully qualifying practical examination, students will be awarded certificate to work with well-known accounting software i.e. Tally ERP.9	3	PO5

Syllabus

Introduction to Computerized Accounting: Advantages and Limitations of Computerized Accounting , Computerized Accounting VS Manual Accounting , Accounting Software ,Types of Accounting Software. Accounting Software Tally: Features of Tally, Various versions of Tally.

Introduction to Tally, Tally Screen Component Company, Creation Alter and Delete Company features , Configuration , Group Company , Creating and Altering a Group Company. Accounts info Groups and sub Groups, Group Creation, Alter, Display and Delete. Ledgers Creation, Alter, Display and Delete Ledgers Practical lab.

Accounting Vouchers, Voucher Types , Payment Voucher , Receipt Voucher ,Contra Voucher , Sales Voucher , Purchase Voucher , Journal Voucher Creation, Alteration and Deletion of Vouchers, New Voucher Types ,Display Vouchers ,Create, Alter and Delete problems practical lab ,Viewing of Reports Trial Balance Trading and Profit and Loss Account Balance Sheet Bank Reconciliation Statement Stock Summary Report Ratio Analysis Funds Flow Statement.

Inventory Info Introduction, Inventory Maintenance, Units of Measurement Creation, Alter and Delete ,Stock Groups , Creation, Display, Alter and Deletion of Stock Groups , Stock Items ,Create, Alter, Display and Deletion of Stock Items. Types of inventory Vouchers: Creation of Sales order and Purchases Order Rejection In and Rejection Out Creation of Cost Centres Creation of Godown. Problems

Tally with GST Applications: Introduction, features of GST, Objectives of GST, Components of GST Creation of company with GST Component, Creation of ledgers CGST,SGST, IGST. Tax rates applicable: GST Rates allocation to in Tally.

RecordingVouchers withTDS (Tax Deducted at Source) Goods and Services Tax (GST) Introduction Shortcut Keys Practice

Reference Books

1 Tally, C. Nellai Kannan, 2016,2nd Edition, Nels Publications, New Delhi. .

2 Tally ERP 9, Ashok K. Nadhani, 2016, 1st Edition, , BPB Publications, 2016, New Delhi .

3 Tally 9, Dr.K.Kiran Kumar, 2016 Edition, Sri Laasya Publications, New Delhi. .

4 Comdex Tally 9 Course Kit , Namrata Agrawal, Sanjay Kumar , 2016 Edition, Wiley, New Delhi..

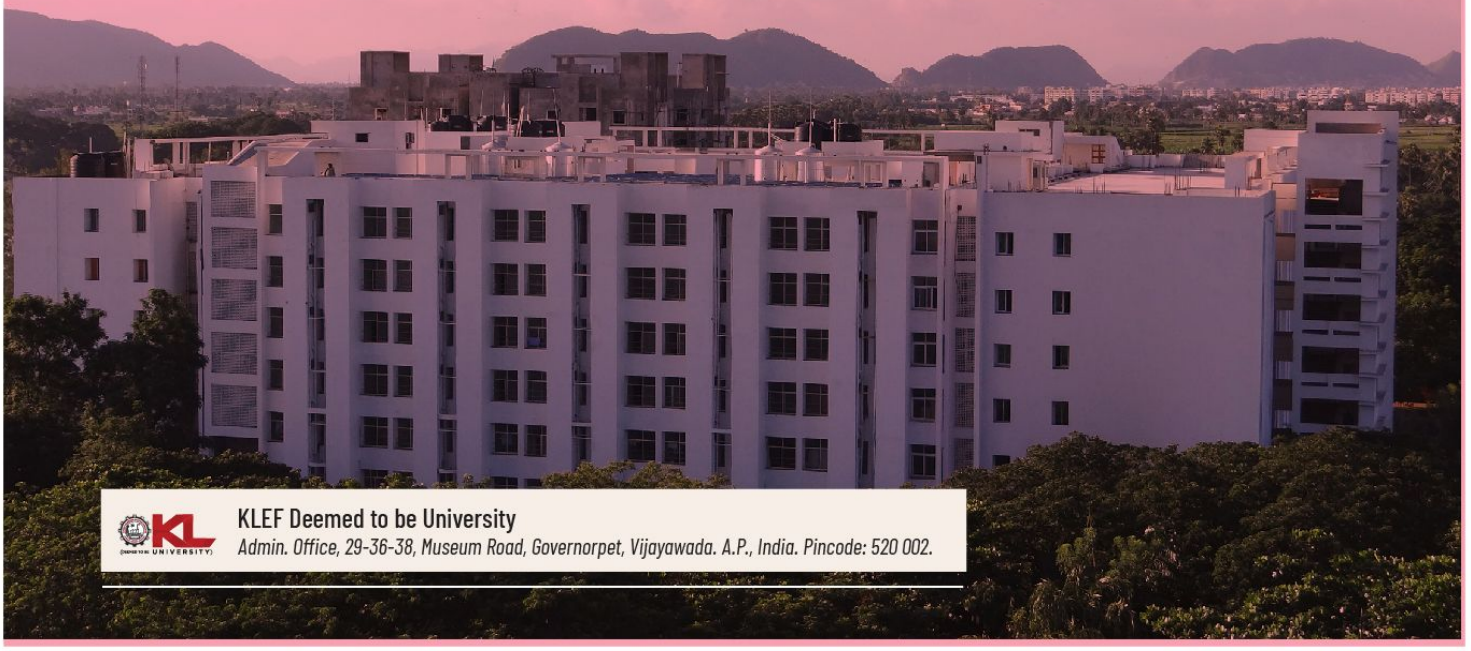
Our Campuses

Green Fields, Vaddeswaram.
Guntur District, A.P., India, Pincode : 522 302.

Aziznagar, Moinabad Road,
Near TS Police Academy, Hyderabad, Telangana,
India, Pincode : 500 075

Bowrampet, ALEAP Industrial Area,
Gajularamaram, Hyderabad, Telangana,
India, Pincode : 500 043

Plot No: 52 & 53, Jubilee Gardens Road No. 2,
Kothaguda, Kondapur, Hyderabad Telangana,
India, Pincode : 500 084



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