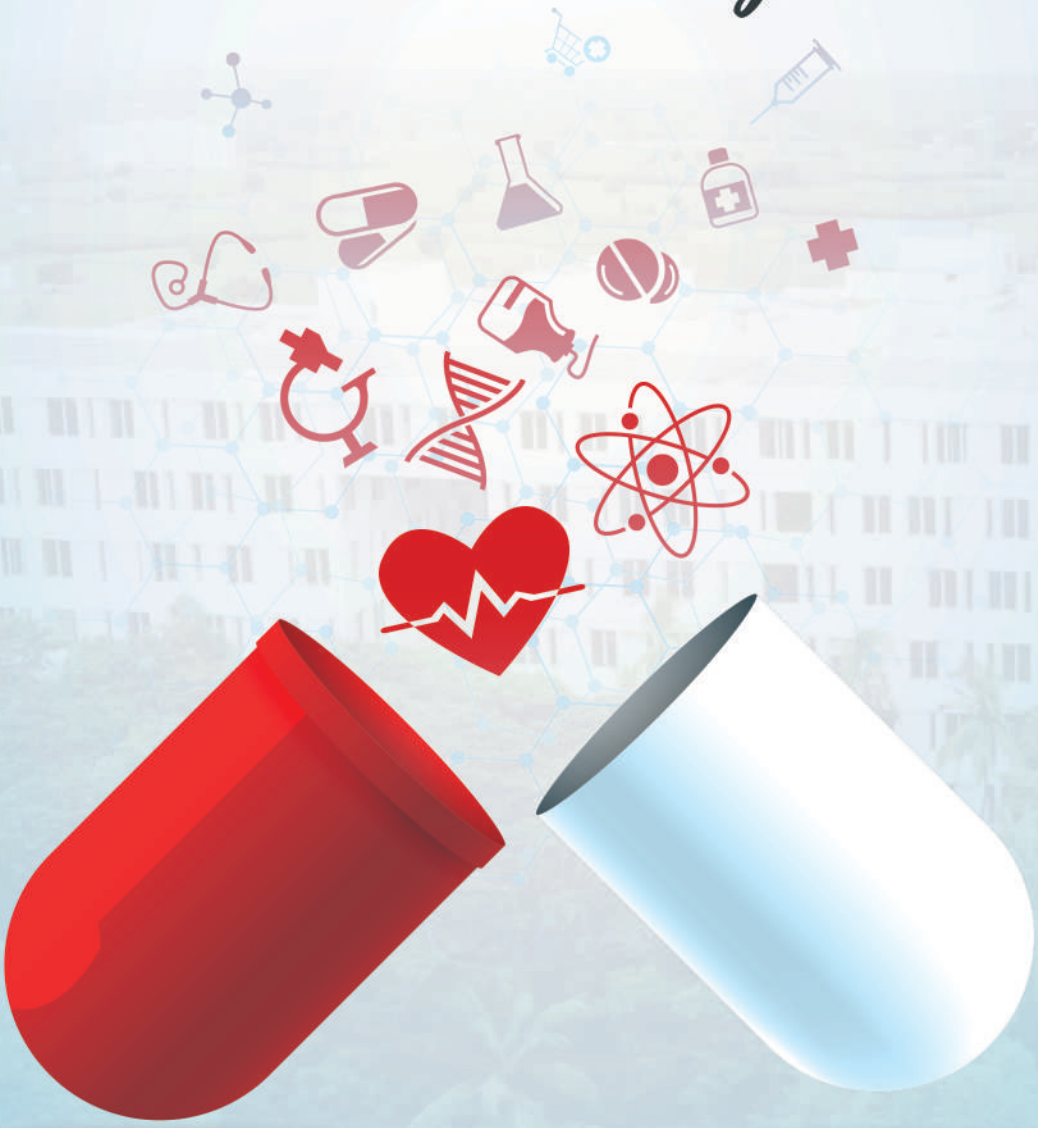
(DEEMED TO BE UNIVERSITY)

STUDENT handbook 2023-2024

B. Pharmacy



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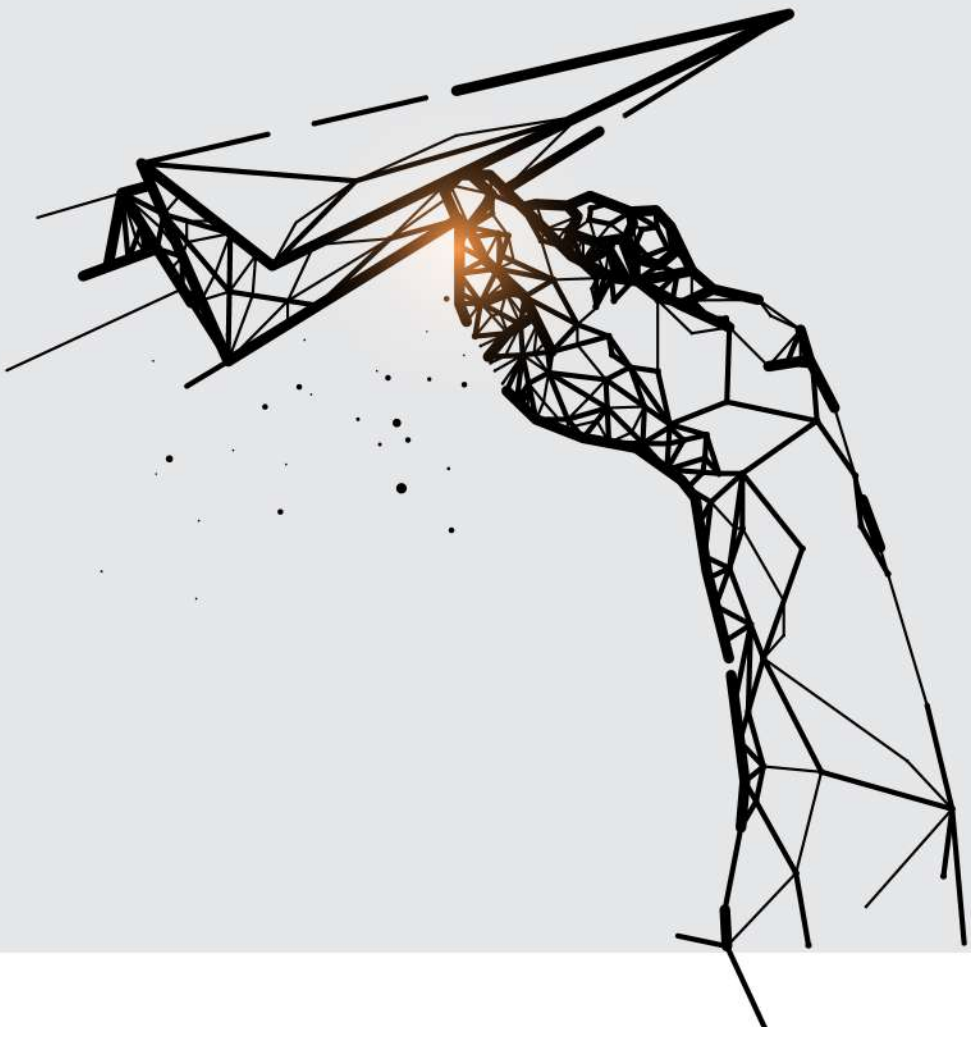
VISION

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.




CATEGORY 1
UNIVERSITY
BY MHRD, Govt. of India
KL ACCREDITED BY
NAAC WITH A++
GRADE
nirf 2023
NATIONAL INSTITUTIONAL RANKING FRAMEWORK
RANKED 28
AMONG ALL
UNIVERSITIES
43 YEARS OF
EDUCATIONAL
LEADERSHIP

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. 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.

Dr. Venkatram Nidumolu

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.

Acronyms

Sl No	Acronyms	Full Form
1	KLEF	Koneru Lakshmaiah Education Foundation
2	CET	Common Entrance Test
3	KLEEE	KLEF Engineering Entrance Examination
4	JEE	Joint Entrance Examination
5	BT	Biotechnology
6	CE	Civil Engineering
7	CS	Computer Science &Engineering
8	EC	Electronics & Communication Engineering
9	EE	Electrical & Electronics Engineering
10	CM	Computer Engineering
11	ME	Mechanical Engineering
12	AD	Artificial Intelligence & Data Science
13	CI	Computer Science & Information Technology
14	CGPA	Cumulative Grade Point Average
15	SGPA	Semester Grade Point Average
16	LTPS	Lecture, Tutorial Practical, Skill
17	SEE	Semester-End Examinations
18	SIE	Semester-In Examinations
19	OJET	On-the-job Engineering Training
20	IRP	Industrial Relations and Placements
21	PS	Practice-School
22	OPAC	Online Public Access Catalog
23	QCM	Quality Circle Meeting
24	MOOC	Massive Open Online Course
25	MOU	Memorandum of Understanding
26	OD	On Duty
27	(A,B]	Between A and B excluding value A and including value B
28	COE	Controller of Examinations
29	VLSI	Very Large-Scale Integration
30	MTech	Master of Technology
31	COA	Council of Architecture
32	JEE	Joint Entrance Examination
33	NATA	National Aptitude in Architecture

34	PC	Professional Core
35	BSAE	Building Science and Applied Engineering
36	PE	Professional Elective
37	PAECC	Professional Ability Enhancement Compulsory Courses
38	SEC	Skill Enhancement Course
39	OE	Open Elective
40	CTIS	Cloud Technology and Information Security
41	DS	Data Science
42	IoT	Internet of Things
43	IPA	Intelligent Process Automation
44	B.B.A.,LL.B.	Bachelor of Business Administration and Bachelor of Laws
45	LL.B.	Bachelor of Laws
46	BCI	Bar Council of India
47	CLAT	Common Law Admission Test
48	HM	Hotel Management
49	BTK	Basic Training Kitchen
50	QTK	Quantitative Training Kitchen
51	ATK	Advanced Training Kitchen
52	MBA	Master of Business Administration
53	BBA	Bachelor of Business Administration
54	MSc (F&C)	Master of Science (Finance & Control)
55	BA	Bachelor of Arts
56	M.Sc.	Master of Science
57	PCI	Pharmacy Council of India
58	PY	Pharmacy
59	B. Com (H)	Bachelor of Commerce with Honors
60	ACCA	Association of Chartered Certified Accountants

CHAPTER 1

INTRODUCTION

The President of Koneru Lakshmaiah Education foundation, Er. Koneru Satyanarayana, along with Late Sri. Koneru Lakshmaiah, founded the K L College of Engineering in the Academic year 1980-81. With the mighty vision and restless efforts of Er. Koneru Satyanarayana K L College of Engineering carved a niche for itself through excellence in engineering education, discipline and record numbers of placements and was the leading college in the state of AP. K L College of Engineering achieved NBA Accreditation for all its B.Tech. Programs in 2004 and later re-accredited in 2007. K L College of Engineering was transformed into an autonomous engineering college in the year 2006. In 2008 this college received a record grade of 3.76 on a 4 points scale with "A" Grade from NAAC; and in February 2009, the college, and Accredited by National Assessment and Accreditation Council (NAAC) of UGC as 'A^{++}' with highest Grade of 3.57 CGPA on 4-point scale in 2018, through its founding society "Koneru Lakshmaiah Education Foundation" was recognized as Deemed to be University by the MHRD-Govt. of India, Under Section 3 of UGC Act 1956. This Deemed to be University is named as "KLEF".

Location

KLEF is situated in a spacious 100-acre campus on the banks of Buckingham Canal of river Krishna, eight kilometers from Vijayawada city. Built within a rural setting of lush green fields, the institute is a virtual paradise of pristine nature and idyllic beauty. The campus has been aptly named "Green Fields" and the splendid avenue of trees and gardens bear testimony to the importance of ecology and environment. The campus ambience is most befitting for scholastic pursuits. The University is situated in a built-up area of around 15, 00,000 S.Ft.

Vision

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Mission

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Facilities

Central Library: E-Resources

The Central Library is the largest and holds materials to serve the whole University community.

It has materials relevant to the Engineering, Science & Humanities courses offered by the University.

The library system contains more than one lakh and fifty thousand books and periodicals on all subjects related to the teaching and research interests of the University staff and students. The library has over 36,000 electronic journal titles, academic databases and32.98 lakhs eBooks. Access is available on campus on student computers and remotely.

The Data Centre

A State-of-the-Art Data center with advanced servers provides a highly interactive learning environment with full-fledged hardware and software training facilities.

Physical Education- Sports Facilities

KLEF encourages students to explore their latent talents by providing good games and sports facilities. The institute is equipped with the following.

Sport/Game	No. of Courts	Sport/Game	No. of Courts
Athletic track	1	Handball Court	1
Hockey Field	1	Netball Courts	2
Badminton Courts	4	Throw ball courts	2
Tennikoit Courts	2	Beach Volleyball Court	1
Cricket Field with Net practice	3	Football Field	1
Volleyball Courts	2	Basketball Courts	2
Tennis Courts	2	Kabaddi Courts	2
Kho Kho Court	1	Table Tennis	6
Soft Ball	1	Chess	20
Archery	1	Caroms	12

The University had a State-of- the - Art Indoor stadium of 30000 sq.ft with:

- 4 wooden Shuttle Courts/ Basketball Court
- Yoga and Meditation Centre
- Dramatics
- 8 Table Tennis Tables
- Hobby Centre
- Gymnasium for Girls
- Gymnasium for Boys
- Multipurpose room with Chess, Caroms etc.
- Power lifting/Weightlifting

Accommodation- Hostels

- KLEF has separate hostels for boys and girls with well furnished rooms and modern amenities.
- The overall atmosphere is very conducive for the students to concentrate on their studies.
- A state- of – the- art kitchen and spacious dining area has been provided for both the hostels.
- Generators have been provided as power backup. Emphasis has been laid on hygiene and cleanliness for healthy living. A customized menu caters to the student needs, it keeps changing according to their tastes.
- Teaching staff will have to address the academic and personal problems of the students. Round-the-clock security, communication, dispensary facilities are also available.

Facilities in the hostels

- Protected drinking water
- State of the art kitchen, dining hall
- Newspapers, telephones, toilets and bathrooms are well maintained.
- Every student in the hostel is provided with a cot, study table, chair and a rack.
- Fan and light are also provided in each room.
- Gas & Steam based hygienic food preparation.
- Palatable regional, national and international cuisines
- Cleanliness and Safety STD/ISD Facilities
- Medical Kits and First Aid Boxes Soft drinks, snacks, Fruits etc.
- Laundry Stationary shop

Hostel Rules and Regulations

- Students are hereby informed that while staying in the hostel, it is essential to be responsible for maintaining dignity by upholding discipline.
- They must be obedient to the hostel warden/floor in –charges. Valuable items like jewelry etc. should not be kept with students while staying in the hostel.
- It is student's own responsibility to safeguard her/his Laptops, Money by locking suitcases and bags.
- If any loss is found, management will not take any responsibility. Students must intimate to the hostel authorities before giving police complaints against losses.
- Students are not allowed to indulge in smoking; consumption of Alcohol, Narcotic drugs etc., and defaulters will be strictly viewed upon.
- Students are directed that after locking their rooms they must hand over the keys to security and can collect them on returning to the hostel.
- Students must switch off Fans, Lights, Geysers, A/C's etc., before leaving their rooms.
- Visitors are not allowed inside the hostel at any time; however, they are allowed into the visitor's hall with the prior permission of the warden.
- Only family members listed by the parents are allowed to contact the student. Visiting hours are up to 7.30 pm only and after 7.30 pm visitors are required to leave the premises.
- Hostel students are not allowed to come into the hostel after 3.00 pm for morning shift students and 6.00pm for day shift students.
- Those students who are utilizing the computer lab, library etc., after the times specified must submit the permission slip to the security while entering the hostel.
- During public holiday outings, those who seek permission to leave the hostel will have to obtain written permission from the warden. Permission will be given only to those students who get permission from parents to leave the hostel during holidays/outings.
- Moving out of campus without permission is strictly prohibited. Strict study hours from 7.30 am to10.30 pm shall be maintained in the hostel.
- The hostellers must be in their allotted rooms during study hours. The general complaints of any kind should be noted in the complaint register, which is available at the hostel office.
- Registered complaints will only be entertained. Any health problem should be brought to the notice of Warden/Floor In – charge for necessary treatment.

Transportation

The institution runs 80 buses covering all the important points in Vijayawada City, Mangalagiri, Guntur & Tenali towns with a total seating capacity of 4000 students in two shifts. Transport is available 24 hrs, In case of any emergency in the institute /hostels. Transportation is available for conducting industrial tours and visits etc. Regular transport facility available up to 10PM.

Healthcare

A full-fledged health center with all the facilities is established to cater the needs of the students, staff, Faculty and the public in the adopted villages. It consists of three doctors (Homoeopathy, Ayurvedic &Allopathy).

Cafeteria

KLEF has a spacious canteen with the latest equipment and hygienic environment which provides quality food and prompts service and caters to the needs of all the students and staff. A central cafeteria of 1500 Sq.m. is available on the campus. Mini cafes and fast-food centers are available in various blocks. The canteen is open from 6:30 a.m. to 8:30 p.m. There is a wide variety of North- Indian and South-Indian cuisine and the students enjoy the pleasure of eating during the breaks. Cool aqua water for drinking is available.

Placements

KLEF has meticulously planned to make all its outgoing students employed. The University had installed the infrastructure, employed well experienced faculty, designed and delivered programs that help to enhance the communication and soft skills which are required for making the students employable. An excellent system is in place that considers all the issues that make a student employable. The University has been successful for the last 7 years in employing all the students who have registered and eligible for placement through its offices located across the country. About 50 trained personnel work extensively to make the students ready for recruitment by the industry.

Counselling & Career Guidance

A special Counseling Cell consisting of professional student counselors, psychologists, and Professors counsels/helps the students in preparing themselves to cope with studies, perform well in the tests & various competitions. This Cell provides its services to the students in getting the solutions for their personal problems and provides career guidance with the help of the Industrial Relations and Placements (IRP) department. A group of 20 students are allotted to each faculty member who counsels them regularly and acts as their mentor.

Social Service Wing

KLEF has a social service wing which is used to channelize the social service activities of the faculty, staff and students. It has adopted 5 nearby villages and conducts activities like medical camps, literacy camps and educates the villagers regarding hygiene and health care on a regular basis.

NSS/NCC wings

NCC/NSS is a credit course designed with an intent to transform NCC/NSS activities into curricular activities from an extracurricular thereby providing credits to students involved in NCC/NSS along with other attended advantages to the students in the university.

Hobby Clubs

Wholly and solely managed by the students, contributed much to the cultural life of the campus and to the cultural evolution of the students. Few student bodies and clubs operate in the campus like music society, dance club, drama society, literary and debating club, English press club, drawing club, painting club, mime club, computer club etc. Students manage entire activities and budget of the organization for the entire semester in advance. Around 4000 students are active members of the Hobby Clubs.

Life Skills and Inner Engineering

KLEF feels that it is its responsibility to mold the students as good human beings, contributing to the country and to society by producing responsible citizens. Along with the regular programs every student admitted into KLEF undergoes a one-week special life skills /orientation program. Through this program, KLEF is producing the students with clarity of thoughts and charity at heart. Strict

regularity, implicit obedience, courtesy in speech and conduct, cleanliness in dress. Life skills and inner engineering teach a student his/her obligation towards GOD, himself /herself his/her country and fellow human beings. Every student is encouraged to practice his/her own religious faith and be tolerant and respectful towards other religions.

Technical Festival

KLEF organizes various programs for the all-round development of the students. The technical festival and project exhibition is organized in the odd semester (October) every year to elicit the innovative ideas and technical skills of the students.

Cultural Festival

The cultural festival in the even semester (February) of every year is the best platform for the students to exhibit their talents and creativity. Through these festivals KLEF is imparting organizational skills, leadership skills, competitive spirit, and team behavior skills to our students. Along with the knowledge, KLEF festivals provide recreation to the student community.

Center for Innovation, Incubation and Entrepreneurship (CIIE)

KLEF being a pioneering institute supporting Academics and Research in Engineering, Science and Technology is endowed with the entire infrastructure and highly experienced faculty, has a Centre for Innovation, Incubation and Entrepreneurship (CIIE) that comprises of: Innovation Centre which aims to inculcate a spirit of innovation. Incubation Centre which aims to incubate innovations through prototype product development. Entrepreneurship Development Centre (EDC) which aims at fostering entrepreneurial skills among the students.

About KL College of Pharmacy

KL College of Pharmacy offers pharmaceutical sciences, in association with other streams like biotechnology which in turn offers innumerable opportunities as chemist, druggist, and novel drug designers in the modern era. The strides taking place in nanotechnology, stem cell therapy, gene editing and several other innovative therapeutic techniques. Incumbents can establish their startups on diagnostic devices, surgical instruments, and medicines.

Vision and Mission of the Department

Vision

Lead the future of global healthcare and well-being of the communities we serve.

Mission

To produce quality Pharmacy professionals having strong theoretical foundation, innovative ideas, good design experience by bridging industry-academic gap in Pharma Sector through the use of technology and innovative teaching and exposure to research and progress with social ethics.

Mission Statements

M1. Education: Provide the most comprehensive and highest quality education for pharmaceutical sciences in a learning environment that embraces diversity, equity, integrity, ethics, moral courage and accountability.

M2. Community service: Conduct health education programs to the community to prevent disease and improve public health and well-ness by fostering an environment that promotes the safe, efficacious, and cost-effective use of medications.

M3. Research: Develop a passion for discovery and innovations with multidisciplinary collaborative research and engage in creative partnerships locally and globally to advance health education, research, and practice.

M4. Entrepreneurship: Encourage and support resourcefulness, originality, imagination, ingenuity, and vision in our students, faculty, and staff. Foster the development of entrepreneurs who have the ability to dream, inspire and innovate and courage to envisage the commercial success and socio-economic productivity of innovations.

Hallmarks of KL College of Pharmacy

- Highly qualified, experienced, and dedicated faculty with teaching, research, and industrial expertise.
- Innovative pedagogical approaches to increase student participation, learning and critical thinking.
- Skills and Value-added courses with global certification.
- Campus Recruitment Training and Placements.
- Development of global environment among the students with more than 50% International students.
- Well-equipped and sophisticated laboratories with state of art infrastructure.
- 100+ paper publications in peer reviewed good impact factor national and international journals indexed with Scopus, Web of Science - SCI etc.
- 10+ book chapters with reputed international publishers like Elsevier, Wiler, Springer, Taylor & Francis.
- Over 30+ MoUs have been signed with top foreign Universities.

CHAPTER 2

PROGRAM EDUCATIONAL OBJECTIVES (PEOs) AND PROGRAM OUTCOMES (POs)

Program Educational Objectives (PEOs)

PEO	DESCRIPTION
1	**Knowledge & Understanding:** The pharmacy students should possess upon graduation, knowledge of pharmaceuticals, medication use and their safety and effectiveness.
2	**Skill:** The graduate should be able to demonstrate his skills in providing quality pharmaceuticals, drug information and therapy including legal and ethical aspects.
3	**Attitude:** The graduate should be able to inculcate the current knowledge, changes in technology, continuous upgrading of professional information and participation in implementation of National health programmes.
4	To develop entrepreneurship qualities that support growth of pharmaceutical intellectual property and contribute for economic development throughout the world.

Program Outcomes (POs)

PO	DESCRIPTION
1	**Pharmacy Knowledge:** Provide basic knowledge for understanding the principles and their applications in the area of Pharmaceutical Sciences and Technology.
2	**Technical Skills:** Develop an ability to use various instrument and equipment with an in-depth knowledge on standard operating procedures for the same.
3	**Modern tool usage:** Develop/apply appropriate techniques, resources, and IT tools including prediction and modelling to complex health issues and medicine effect with an understanding of the limitations.
4	**Research and Development:** To demonstrate knowledge of identifying a problem, critical thinking, analysis and provide rational solutions in different disciplines of Pharmaceutical Sciences and Technology
5	**Lifelong Learning:** Develop an aptitude for continuous learning and professional development with ability to engage in pharmacy practice and health education programs.
6	**Pharmaceutical Product development:** To apply the knowledge of manufacturing, formulation and quality control of various pharmaceutical and cosmetic products.
7	**Environment and Sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts and demonstrate the knowledge for sustainable development.
8	**Ethics:** Follow the code of ethics and commit to professional values and responsibilities and norms of the pharmacy practice.
9	**The Pharmacist and Society:** Apply reasoning informed by the contextual knowledge to comprehend medical prescription, perform patient counselling and issue or receive clear instructions on drug safety and the consequent responsibilities relevant to the professional pharmacy practice.
10	**Communication:** Communicate effectively on health care activities with the medical community and with society at large, to comprehend drug regulations, write health reports and provide drug information.

11	**Competitive skills:** Develop problem – solving skills and aptitude to participate and succeed in competitive examinations.
12	**Invention and entrepreneurship:** Application of technical skills to integrate health care systems, design effective product with commercial advantage and societal benefit, perform risk analysis and become entrepreneur.

Program Specific Outcomes (PSOs)

PSO	DESCRIPTION
1	**Pharmaceutical product development:** To apply the knowledge of manufacturing, formulation and quality control of various pharmaceutical and cosmetic products in the form of powders, tablets. Capsules, parenteral, solutions, suspensions, emulsions, creams, lotions and aerosols etc.
2	**Invention and Entrepreneurship:** Find the application of modern tools to integrate health care systems, design an effective product with commercial advantage and societal benefit, perform risk analysis and become entrepreneur.

Mapping of PEOs with Mission statement

S.No	Description of PEOs	Key Components of Mission			
		M 1	M 2	M 3	M 4
		High quality Education	Community service	Research and Development	Entrepreneurship
PEO 1	To produce pharmacist workforce competent for the society	✓	✓		
PEO 2	To produce pharmacy graduates with employable skills and high technical competence in pharmaceutical industry and health care sectors	✓			✓
PEO 3	To inculcate research activity and develop passion for discovery and innovations			✓	
PEO 4	To develop entrepreneurship qualities that support growth of pharmaceutical intellectual property and contribute for economic development throughout the world.				✓

CHAPTER 3

PROGRAMS LIST AND ELIGIBILITY CRITERIA

UG Courses

S.NO	NAME OF THE PROGRAM	DURATION (Years)
1	BACHELOR OF PHARMACY	4

PG Courses

S.NO	NAME OF THE PROGRAM	DURATION (Years)
1	DOCTOR OF PHARMACY	6
2	MASTER OF PHARMACY	2

Eligibility Criteria for Admission in B. Pharmacy

First year B. Pharm: Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

B. Pharm lateral entry (to third semester): A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

CHAPTER 4

ACADEMIC REGULATIONS

Terminology

- **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 it has the right to take decisions on 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 semesters i.e., Even and Odd semester.
- **Academic Pathways:** Students of all programs of study are given the opportunity to choose their career pathways viz. Employability, Innovation and Research. Each of these pathways prepares the students in a unique way, enabling them to achieve the heights of their career.
- **Academic Bank of Credits (ABC):** It 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.
- **Backlog Course:** A course is considered to be a backlog if the student has obtained a failure grade (F).
- **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.,)
- **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.
- **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.
- **Choice Based Credit System:** The institute adopts Choice Based Credit System (CBCS) on all the programs offered by it which enables the students to choose their courses, teachers and timings during their registration. This enables the students to decide on the courses to be done by them in a specific semester according to their interests in other activities.
- **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 upto 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.
- **Course Withdrawal:** Withdrawing from a Course means that a student can drop from a course within the first week of the odd or even Semester (there is no withdrawal for summer semester). 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.
- **Degree:** A student who fulfils all the Program requirements is eligible to receive a 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.
- **Detention in a course:** Student who does not obtain minimum prescribed attendance in a course shall be detained in that course. Refer to Attendance & Detention Policy
- **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.
- **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.
- **ERP:** ERP (Enterprise Resource Planning) system is a comprehensive software solution designed to streamline and automate various administrative, academic, and financial processes within the University. It manages student information, including admissions, registration, enrollment, attendance, grades, and academic records.
- **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.
- **Industrial Visit:** Visit to a company/firm as per the academic requirement.
- **In-Semester Evaluation**: Summative assessments used to evaluate student learning, acquired skills, and academic attainment during a course.
- **LMS:** LMS stands for Learning Management System. It is a platform used in the institution to manage and deliver courses. Students can access learning resources, participate in online

discussions, submit assignments, take assessments, and communicate with their instructors and peers.

- **Make-up Test:** An additional test scheduled on a date other than the originally scheduled date.
- **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 7^{th} or 8^{th} semester of his/her Academic Year to meet the final requirements for the award of B.Tech degree.
- **Pre-requisite:** A course, the knowledge of which is required for registration into higher level course.
- **Professional Core:** The courses that are essential constituents of each engineering discipline are categorized as Professional Core courses for that discipline.
- **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 Outcomes:** Program outcomes are statements that describe what students are expected to know or be able to do at the end of a program of study. They are often seen as the knowledge and skills students will have obtained by the time, they have received their intended degree.
- **Program Educational Objectives:** The broad career, professional, personal goals that every student will achieve through a strategic and sequential action plan.
- **Project:** Course that a student has to 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.
- **Supplementary**: A student can reappear only in the semester end examination for the Theory component of a course, subject to the regulations contained herein.
- **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.
- **Semester:** It is a period of study consisting of 16 ± 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.
- **Single Section Course:** Course taught for a single section.
- **Social Service:** An activity designed to promote social awareness and generate well-being; to improve the life and living conditions of the 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.
- **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.

Academic Instructions

General Behaviour

- Student should communicate in English with faculty and other students while he/ she is in campus.
- Students are expected to wish/greet all officials of the KLEF with due respect.
- Students should be courteous and polite while communicating with all Faculty & staff.
- Students should maintain silence and/or speak in a polite way in and around the classrooms, library, laboratories, and offices of the Deans, Program Chairs, Senior Officials, faculty rooms and corridors of academic buildings.
- It must be noted that shouting, talking in loud voice or in chorus, using indecent, abusive and discourteous language anywhere within the institution premises are considered serious acts of indiscipline and are punishable.
- Students should not loiter during the free time in the university campus.
- Students should not issue any public or press statement, send letters to editors, government, public servants or notaries without prior permission and approval of the Registrar of KLEF in writing.
- Students should keep the status, dignity, prestige and reputation of KLEF high and not engage in anything that might directly or indirectly undermine the standing of the institution.
- Students must always adhere to a prescribed/decent dress code befitting the dignity of a technical/professional student within the campus.
- Ragging of any student is a serious act of indiscipline and has been totally banned by the Hon'ble Supreme Court of India.
- A student found involved in any form of ragging, verbal or physical, inside or outside the institutional campus, hostels, or buses shall be treated as per the anti-ragging rules of the KLEF.
- Students must not be involved in quarrelling or fighting or any indecent verbal or physical activity among themselves, or with staff and faculty or visitors.
- Direct or indirect involvement in any such activity will be considered as serious breach of discipline and strict disciplinary action will be taken against the students that engage in such activities.
- Students are not allowed to sit on the steps, boundary walls on the higher floors of any building, or engage in gossiping, making noise or any other such activity.

KLEF Working Hours: KLEF operates between 7:20 AM to 5.00 PM (in shifts) on all weekdays.

Class Environment: The institute is a community of learners. Students have a responsibility of creating and maintaining an environment that supports effective learning to receive effective instructions in classrooms and laboratories. KLEF expects students to conduct themselves in an orderly and cooperative manner by adhering to University Rules & Regulations.

Laboratory Environment

A conducive learning environment in the laboratory is essential and the students are advised to follow the guidelines mentioned below:

- Always listen carefully to the faculty especially for the safety precautions to take in the laboratories.
- Accidents resulting in injuries may occur if precautions are not taken.
- Eating in laboratories is strictly prohibited.
- Proper dress code is to be followed as prescribed by faculty in each lab.
- Students should familiarize themselves with the location of all the safety equipment which may be available.
- Follow evacuation procedures quickly and quietly, if needed.
- Students should always conduct themselves in a responsible and cautious manner. Risky behaviours such as pushing, running, jumping etc., are unwarranted.
- Only materials required to complete and record the experiment instructions, (e.g., pencils or graph paper, etc.) should be brought into the laboratory.
- Equipment must be carefully handled to prevent breakage or damage, otherwise appropriate penalties/disciplinary-action may believe/imposed.
- Lab station must be cleaned prior to leaving a lab.
- Any accident, no matter how small or big, must be reported to the concerned faculty immediately.

Registration Process

- For every course, the student must undertake the registration process prior to commencement of the coursework, based on the following conditions.
- Registration into a course will be permitted only for such courses, which are offered by KLEF in that semester.
- A student must clear the pre-requisite(s) if any, to register into a course.
- KLEF reserves the right to register.
- Registration for add/drop/change of a course will be permitted only within one week from the scheduled date of commencement of classes.
- Students can register up to a maximum of 32 credits of their choice in a semester to meet their program requirements.
- Students, who wish to register for additional credits through Overloading or less credits through Under loading, must seek prior permission from Dean- Academics.
- Students who have opted for minor degree, Honours degree, can register for a greater number of credits in a semester through Overloading (subjected to guidelines appropriate to compliance on eligibility).
- KLEF reserves the right to withdraw within one week of the commencement of the semester any elective course offered, if adequate number of students have not registered or for any other

administrative reasons. In such cases, the students are permitted to register for any other elective course of their choice provided they have fulfilled the eligibility conditions.

- KLEF reserves the right to cancel the registration of a student from a course or a semester or debar from the degree on disciplinary / plagiarism grounds.
- A student is solely responsible to ensure that all conditions for proper registration are satisfied. If, there is any clash in the timetable, it should be immediately brought to the notice of the Department Year coordinator for necessary corrective action.
- The registration may be cancelled for a course or the entire semester either by KLEF if any irregularity is found at a later stage.

Student Course Registration Process:

To complete the student registration, student login to new ERP portal with their valid login credentials. After login student should click on Academic Registrations Student Course Registration. Now Student can view the courses and sections in dropdown menus. Student can select the sections against the courses on their own choice. Student can view the timetable on top of the selection of each course and section.

CHAPTER 5

PROGRAM CURRICULUM

For an academic program the curriculum is the basic framework that will stipulate the credits, category, course code, course title, course delivery (Lectures / Tutorials / Practice / Skill / Project/ Self Study / Capstone Design etc.), in the Choice Based Credit System. However, all such are essentially designed, implemented and assessed in Outcome Based Education Framework.

Program Structure:

- An Academic Year is made of two semesters each is of, approximately 16±1-week duration and each semester is classified as:
    - Odd Semester (September to January)
    - Even Semester (January to June).
- KLEF may offer summer term between May and June.
- Students have the flexibility to choose courses of their own choice prescribed by the institution.
- Student can register for a maximum of 30 credits, other than audited and certificate courses per semester. This is not applicable when student exercises the overloading option (while doing project work / practice school / Minor degree / Honors degree program / specialization).

Course Structure:

- Every course has a Lecture-Tutorial-Practice-Skill (L-T-P-S) component attached to it.
- Based upon the L-T-P-S structure the credits are allotted to a course using the following criteria.
    - Every 1 hour of Lecture / Tutorial session is equivalent to one credit.
    - Every 2 hours of Practical session is equivalent to one credit.
    - Every 4 hours of skill-based practice is equivalent to one credit.
    - The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2.
    - Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

Sl No	Course Category	Min. Credits
1	HAS	11
2	BSC	9*/10#
3	ESC	NA
4	PCC	186
5	FCC	NA
6	SDC	2
7	PEC	8
8	PRI	6
9	OEC	NA

10	VAC	NA
11	AUC	NA
12	SIL	NA
GRAD REQUIREMENTS		**222*/223#**

Note: * = Students who have studied Biology in Intermediate and opted Remedial Mathematics

= Students who have studied Maths in Intermediate and opted Remedial Biology

Course Classification:

Any course offered under M. Pharmacy program is classified as:

- **Humanities Arts & Social Science Courses (HAS):** Humanities, arts, and social sciences (HAS) courses are a broad field of study that encompasses the study of human culture and society. These courses focus on developing students' critical thinking, problem-solving, and communication skills. These skills are valuable in a variety of careers, and they can also help students become more engaged citizens.
- **Basic Science Courses (BSC):** Basic science courses are the foundation of all science education. They provide students with the knowledge and skills they need to understand the natural world. Basic science courses typically cover Mathematics, Physics, Chemistry, Biology etc., Basic science courses are essential for students who want to pursue careers in science, engineering, medicine, and other STEM fields.
- **Professional Core Courses (PCC):** Professional core courses are a set of courses that are essential for all engineering students. These courses provide students with the knowledge and skills they need to be successful in their chosen engineering discipline.
- **Professional Elective Courses (PEC):** Professional electives are a set of courses that are chosen by students to supplement their engineering education. Professional electives are a great way for students to customize their engineering education and prepare for their future careers. By choosing electives that are relevant to their interests and goals, students can gain the knowledge and skills they need to be successful in their chosen field.
- **Open Elective Courses (OEC):** Open electives are a set of courses that are not specifically related to Pharmacy, but that can provide students with knowledge and skills that are valuable in a variety of fields. Open electives are a great way for students to broaden their horizons and explore their interests outside of engineering. By choosing electives that are relevant to their interests and goals, students can gain the knowledge and skills they need to be successful in a variety of fields.
- **Skill Development Courses (SDC):** Skill development courses can provide students with the knowledge and skills they need to use specific software or hardware. This can be especially important for students who are interested in pursuing a career in a particular field.
- **Project Research & Internships (PRI):** Project, Research and Internships can help students gain a better understanding of their chosen field by giving them the opportunity to apply their knowledge and skills to real-world problems. These can help students explore their interests by giving them the opportunity to work on projects that they are passionate about.
- **Value-Added Courses (VAC):** Courses leading to certification and those which are conducted exclusively for employability are referred to as value added courses. Though “Satisfactory” completion of value-added courses doesn’t acquire any credit but they are part of the graduation requirements.

Course Precedence:

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

- Every 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.

Summer Term Courses:

KLEF offers summer term courses during May and June. The following are the guidelines to register in to courses offered in Summer Semester.

- A student may register for course/s in each summer term by paying the stipulated fee.
- Students registering for more than one (1) summer course must ensure that there is no clash in the time table.
- A student can register into a detained course or a not-registered course (course offered in regular semester, but student failed to register due to the non- compliance of pre-requisite condition but has paid the fee.) A student can also register for other than the above two mentioned categories of courses only if they are permitted for acceleration.
- In any case, a student can register only for a maximum of 12 credits during summer term.
- Attendance & Promotion policy for summer term is same as compared to the regular semester except for condonation policy. Condonation is not applicable for summer term courses.

CHAPTER 6

REQUIREMENTS FOR THE AWARD OF DEGREE

The student is awarded a B. Pharmacy degree provided she/he

- Must successfully earn a minimum of 224 credits, as stipulated in the program structure.
- If the Student have studied Biology in Intermediate and opted Remedial Mathematics 224 credits are required to obtain the degree
- If the Student have studied Maths in Intermediate and opted Remedial Biology 225 credits are required to obtain the degree
- Must have successfully obtained a minimum CGPA of 5 at the end of the program.
- Must have finished all the above-mentioned requirements in less than twice the period mentioned in the Academic structure for each program, which includes deceleration period chosen by the student, deceleration imposed by KLEF or debarred from the KLEF.

Regulation	Measure	Min. Requirement
Min Credits	Credits	222/223
Min CGPA	CGPA	5
SGPA Consistency	NA	NA
Value Added Courses	#Courses	3
Audit Courses	NA	NA
Audit Courses for Career Enhancement	NA	NA
Specialization Stream	NA	NA
Social Internship	NA	NA
Technical Internship	NA	NA
SDC Stream	NA	NA
Course Modes (Mode A | Mode P)	NA	NA

Award of Degrees

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

1. Minimum of 5 CGPA is considered as Pass criteria for a student.
2. CGPA of 7.5 and above will be awarded First class with Distinction provided the student has cleared all the courses in first attempt and must have fulfilled all the program requirements within the specified minimum years duration.
3. CGPA of 6.00 to 7.49 will be awarded First class
4. CGPA of 5.00 to 5.59 will be awarded Second class

CHAPTER 7

ATTENDANCE RULES AND DETENTION POLICY

Attendance policy for promotion in a course:

The student must maintain a minimum attendance of 85% in every course. In case of medical exigencies, the student/parent should inform the principal within a week by submitting necessary proofs and in such cases the attendance can be condoned up to an extent of 10%. by Principal on the recommendation of the Head of the Department.

- Attendance in a course shall be counted from the date of commencement of the classwork.
- Attendance for the students who are transferred from other institutes and for new admissions, attendance must be considered from the date of her/his admission.
- In case of attendance falling marginally below 75% due to severe medical reasons or any other valid reasons, the Principal/Program chair may bring such cases, along with valid and adequate evidence, to the notice of the Dean Academics. The condonation board formed by Vice-Chancellor under the chairman ship of Dean-Academics will consider any further relaxation in attendance from the minimum attendance percentage requirement condition after going through case by case.

Attendance based Marks:

As per the PCI guidelines there are certain marks for attendance to be awarded for each subject and it is clearly reflected in the respective course handouts which should duly be approved by the Dean Academics. For any course, not more than 5% marks can be allotted for attendance.

For B. Pharm (Theory courses) the distribution of marks, if the attendance percentage is 95-100 is 4 marks, 90-94 is 3 marks, 85-89 is 2 marks, 80-84 is 1 mark and <80 is 0 marks. Further, for B. Pharm (Practical Courses) the distribution of marks, if the attendance percentage is 95-100 is 2 marks, 90-94 is 1.5 marks, 85-89 is 1 mark, 80-84 is 0.5 marks and <80 is 0 marks.

Attendance Waiver: Students maintaining a CGPA ≥ 9.00 and SGPA ≥ 9.00 in the latest completed semester get a waiver for attendance in the following semester. Students who thus utilize an attendance waiver will be awarded the marks allocated for attendance (if any) based on their performance in an advanced assignment specified by the course coordinator (emerging topics related to the course). S/he can appear in all assessments and evaluation components without being marked ineligible due to attendance-based regulations.

Attendance Condonation for Participation in KLEF / National / International Events: Only those students nominated / sponsored by the KLEF to represent in various forums like seminars / conferences / workshops / competitions or taking part in co- curricular / extra- curricular events will be given compensatory attendance provided the student applies in writing for such a leave in advance and obtain sanction from the Principal basing on the recommendations of the Head of the Department (HoD) for academic related requests; or from the Dean Student Affairs for extracurricular related requests. For participation in the KLEF's placement process the names of students will be forwarded by the placement cell in-charge to the respective Heads of the Departments. Students participating in KLEF/National/International events like technical fests, workshops, conferences etc., will be condoned for 10% of total classes conducted for each course in the semester. This condonation is not applicable for summer term.

Course Based Detention Policy:

In any course, a student must maintain a minimum attendance as per the **attendance policy for promotion in a course**, to be eligible for appearing in the Sem-End examination. Failing to fulfill this condition, will deem such student to be detained in that course and become ineligible to take semester end exam.

Eligibility for appearing Sem – End Examination:

A Student registered for a course and maintained minimum attendance of 85% 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
- Detained
- Acts of indiscipline
- Withdrawal from a course

CHAPTER 8

ASSESSMENT AND EVALUATION PROCESS

The assessment is conducted in formative and summative modes with a weightage of 25% for Semester-In evaluation and 75% for Semester-End Evaluation.

The distribution of weightage for various components of formative and summative modes 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. Students are advised to refer 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.
- Students may have to take more than one examination in a day during Sem-In exams, Semester-End Examinations /Supplementary examinations.
- Examinations may be conducted on consecutive days, beyond working hours and during holidays.

Semester-In Evaluation

The following are the guidelines for the Semester-In evaluation.

- The process of evaluation is continuous throughout the semester. The distribution of marks for Semester-In evaluation is 25% of aggregate marks of the course.
- 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.

Semester End Examination

- The distribution of marks for Semester-End evaluation is 75% of aggregate marks of the course
- The pattern and duration of Sem End examination are decided and notified by the Course Coordinator through the Course handout, after approval from the Dean Academics.
- 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.

Assessment of Project/Research-Based Subjects

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

Absence in Assessment & Examination

If a student fails to take any formative assessment component (due to ill-health or any valid reason), no second chance will be given, and zero marks will be awarded for the same. In cases of excused absence, the instructor may provide an opportunity to the student to reappear in quizzes or assignments or any other internal assessment criteria based on the approval from the principal & the concerned Head of the Department in written. If a student fails to write Sem-In Exam-I or obtained less than 50% marks in Sem-In Exam-I, he must attend remedial classes and maintain a minimum 85% of attendance in remedial classes to be eligible for Make-up test for Sem-In exam-I. Further, the number of remedial classes to be conducted shall be 50% of regular classes held till the Sem-In exam-I. However, there is no make-up test for Sem-In Exam-II or for the Laboratory exams.

A student's absence for Sem-In exams under the following circumstances are only considered for makeup test.

- Pre-approved participation in University/State/National/International co- curricular and extra-curricular activities
- Ill health and medical emergencies for the student leading to hospitalization with certification by the doctor stating inability of student to attend Sem-In exams clearly within the necessary dates.
- Death of immediate family member

Remedial Classes & Remedial Exam

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

- Students who did not attend or obtain a minimum of 50% marks in the Sem-In examination-1
- Students for whom the learning objectives of CO1/CO2 are not attained in the Sem-In examination-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 are scheduled to be conducted usually one- or two- weeks after the conclusion of Sem-In exam-1.
- The number of remedial classes to be conducted shall be 50% of regular classes held until the Sem-In exam-I.
- Remedial classes MUST NOT be scheduled during regular class work hours.

The following are the guidelines for remedial exams:

- Students attending remedial classes must maintain attendance of minimum 80% in classes conducted under remedial classes, without fail for being eligible for attending remedial exam.
- After conduction of remedial test, the Sem-in exam-1 marks will be updated by considering the weightage of 75% of marks obtained by student in remedial exam, and 25 % of marks obtained by student in regular exam; with a CAP of 75% in overall marks.

Grading Process

At the end of all evaluation components based on the performance of the student, each student is awarded grade 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.

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	80-89.99
Good	B	8	70-79.99
Fair	C	7	60-69.99
Average	D	6	50-59.99
Fail	F	0	Less than 50
Fail	AB	0	Absent

SGPA & CGPA

The SGPA is the ratio of sum of the product of the number of credit s with the grade points scored by a student in all the courses and the sum of the number of credits of all the courses undergone by a student, in a semester.

Where 'Ci' is the number of credits of the i^{th} course and *'Gi'* is the grade point scored by the student in the i^{th} course.

The CGPA is also calculated in the same manner considering all the courses undergone by a student over all the semesters of a program, where 'Si' is the SGPA of the i^{th} semester and *'Ci'* is the total number of credits in that semester.

- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- CGPA can be converted to percentage of marks: 10 X CGPA -7.5
- A student appearing for a course having lab integrated with theory and in case obtains less than 40% in either of lab or theory component of semester end examination, and in such case the student must reappear for the component only in which he has

secured less than 40%. Till successful attainment of minimum 40% of both components, the student remains in the F grade for that course.

- Audit/Certificate courses are graded as satisfactory (S) or non- satisfactory (NS) only.
- At the end of each semester, the KLEF issues a grade sheet indicating the SGPA and CGPA of the student. However, grade sheets will not be issued to the student if he/she has any outstanding dues.

Illustration of Computation of SGPA and CGPA

SGPA Computation

Course	Credits	Grade Letter	Grade Point	Credit Point (Credit X Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X 10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			139

Thus, SGPA =139/20 =6.95

CGPA Computation

Item	Semester					
	I	II	III	IV	V	VI
Credits	20	22	25	26	26	25
SGPA	6.9	7.8	5.6	6.0	6.3	8.0

Thus, $$CGPA = \frac{(20*6.9+22*7.8+25*5.6+26*6.0+26*6.3+25*8.0)}{(20+22+25+26+26+25)} = 6.73$$

Betterment

A student may reappear for semester end examination for betterment only in the theory part of the course for improving the grade, subject to the condition that, the student has passed the course, his/her CGPA is ≤ 6.75 and the grade in the respective course to be equal to or lower than "C". In the case of reappearing for a course, the best of the two grades will be considered. A Student can re-register in any course in any semester during the program for improvement of grade if the current grade in the course is lower than B+ and with due approval from Dean Academics in accordance with academic regulations. A student cannot reappear for semester end examination in courses like Industrial Training, courses with their L-T/ST-P-S Structure like 0-0-X-X, Project, Practice School and Term Paper.

CHAPTER 9

PROMOTION

Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of B. Pharm. program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

Credit Transfer

Credit transfer from other institutions to KLEF or vice versa is permitted.

Rustication

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

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:

a. The grade obtained through betterment/ supplementary will not be considered for this award.

b. S/he must have obtained first class with distinction for the award of Gold or Silver-medal.

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. Moreover, 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.

CHAPTER 10

STUDENT COUNSELLING AND FEEDBACK

Student Counselling

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:

1. Has CGPA of less than 6.00.
2. 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.

Counselling Policy

Student counselling takes great place in K L University. Counselling is designed to facilitate student achievement, improve student behaviour, subject analysis levels, attendance, and help students develop socially, professionals with bachelor's, master's degrees or beyond. Faculty counsellors provide counselling and serve an educational role in K L University. We have Mentors, Academic, Career, Physiological, Co-Curricular & Extra-Curricular activities counsellors in order to support students who are experiencing personal or academic challenges, help students choose careers and plan for university and intervene when students face behavioural, physical, or mental health challenges.

Academic Counselling

1. Counsellor shall acquire backlog data and record the same into the counselling sheets.
2. Counsellor will acquire data about the attendance and performance in the internal evaluation and record them into the counselling data sheet.
3. Counsellors shall counsel the students regularly to track the performance of the students.
4. The counselling data sheet shall be submitted to the principal for verification and approval.
5. At the end of the semester a summary report will be sent to Dean Academics Office.

Career Counselling

1. Counsellor has to take SWEAR analysis data in first year.

2. Counsellor shall acquire the data related to performance of the students in all the soft skills and other courses that contributes towards employability/ entrepreneurship/ career advancement the career counselling data sheets.
3. Counsellor will acquire data about the attendance and performance of the students during all the placement drives conducted by KLU and records the same into the counselling sheet.
4. Counsellors shall counsel the students regularly when the performance of the student is found be un-satisfactory.
5. The counselling sheet shall be verified by principal and corrective actions if any will be recommended to the respective departments.
6. At the end of the semester a summary report will be sent to Dean Academics Office.

Psychological Counselling

1. Counsellor shall acquire data pertaining to psychological status of the students and record the same into the counselling sheets.
2. Counsellor will acquire data about the attendance and performance in the internal evaluation and record them into the counselling sheet and see whether the performance is in any way related.
3. Counsellor shall counsel the students regularly when the performance of the student is found to be un-satisfactory.
4. Counsellors should identify the need of any therapy required.
5. Once it is identified, the counsellor will arrange the treatment according to the psychological status of the student.
6. Counsellor should maintain the progression level of the student periodically.
7. The counselling sheet shall be verified by principal and corrective actions if any will be recommended to the respective departments.
8. At the end of the semester a summary report will be sent to Dean Academics Office.

The duties of counsellors

Mentoring: Plan and design a system for student behavior, mental health and academic challenges, define structural and functional characteristics of the system in detail, plan provisions for academic mentoring apart from classroom interaction.

Academic Counselling: Develop a systematic and process-oriented mechanism to improve academic counselling in relation to student attendance, punctuality, performance of students in internal and semester examinations, course / program to be enrolled based on the strength and weakness of the student.

Career Counselling: Conduct personality test (SWEAR) to find suitable career path, create awareness on the job opportunities, career paths that exist in a specific discipline.

Psychological Counselling: Organize and strengthen the student counselling services, engage qualified and experienced mentors and advisories for each class of students for providing psychological guidance as required.

Guidance on Co-Curricular & Extra-Curricular activities

Form student clubs to give train and encourages the students to improve their skills, physical fitness and mental strength.

Counselling Procedures

- The HOD will allot 20 Students once admitted into a program to a faculty with allocation priority commencing from professors and onwards.
- The faculty concerned will be called a counsellor/mentor.
- One hour per week will be allocated by the departments to enable the counsellors to counsel the students on various aspects.
- The counsellor will maintain a separate sheet to record student performance and also different kinds of counselling undertaken.
- Counsellor shall communicate with parents through mail, SMS and also through telephonic conversations. Student's attendance, marks, placement etc. data must inform to parents once in a month.
- The communication undertaken shall be recorded in a separate register.

Feedback System

At KLEF, monitoring of feedback is a continuous process. Feedback is obtained from students and parents on various aspects. Feedback is taken through personal interaction with students, interaction with parents in addition to mid-semester and end-semester feedback. The institution assesses the learning levels of the students, after admission and organizes special programs for advanced learners and slow learners.

Feedback Types

In first year SWEAR analysis is done for every student in such a way it identifies their interests, pre-existing knowledge, aspects to improve technical and logical skills based on their career choice.

The following are the different types of feedback taken at regular intervals:

1. Student General Feedback (Twice in a Sem.)
2. Student Satisfaction Survey (Once in a Sem.)
3. Student Exit Feedback (Once in a Year)
4. Academic Peers Feedback on Curriculum (Once in a Sem.)
5. Parents Feedback on Curriculum (Once in a Sem.)
6. Alumni Feedback on Curriculum (Once in a Sem.)
7. Industry Personnel Feedback on Curriculum (Once in a Sem.)
8. Student Feedback on Curriculum (Once in a Sem.)
9. Faculty Satisfaction Survey (Once in a Sem.)
10. Parent Teacher Association (Once in a Sem.)

Feedback Procedure

- General Feedback to be taken from the students on the aspects like Course Contents, Teaching Learning Process, Outcomes, Resources and Evaluation twice in every semester (Mid semester and End Semester Feedback) in a structured format floated by dean academics office.
- Student Satisfaction Survey (SSS) to all innovative methods and approaches should be recorded at appropriate intervals and the process should be refined based on that. Students should be sensitized on the process and methods and their understanding of the same should be assured.
- Exit survey feedback to be taken from the final year students on the aspects like entrance test, admission process, Course Contents, Teaching Learning Process, Outcomes, Resources and Evaluation, placements etc.
- Structured feedback for design and review of syllabus – semester wise / year wise is received from Students, Alumni, Peers, Parent, Industry Personnel.
- Satisfaction Survey to be taken from the existing faculty on Course Contents, Teaching Learning Process, Outcomes, Resources and Evaluation once in every semester in a structured format floated by dean academics office.
- Parent Teacher Association (PTA) to develop the potential of parents and to strengthen their relationship with their children through planning and conducting a variety of developmental and recreational activities.
- Online Feedback is collected from all the students once at the end of the semester using well designed questionnaire. Informal feedback will be collected in parallel from selected student representatives within 4-5 weeks of commencement of the semester by the Office of Dean Academics.
- HODs have to submit monthly /semester / Academic Year Feedback reports with necessary comments and proofs to Dean Academics office duly signed by concerned Principal/Director.

CHAPTER 11

PROGRAMME STRUCTURE

Koneru Lakshmaiah Education Foundation												
KL College of Pharmacy												
B. Pharmacy 2023-24 Admitted Batch Course Structure												
Sl No	**CourseCode**	**Course Title**	**Name**	**Category**	**Mode (R/A/P)**	**L**	**T**	**P**	**S**	**Cr**	**CH**	**Pre- requisite**
1.	22PY1105T	Communication skills (Theory)	CS-T	HAS	R	2	0	0	0	2	2	Nil
2.	22PY1105P	Communication skills (Practical)	CS-P	HAS	R	0	0	2	0	1	2	Nil
3.	23UC1101	Integrated Professional English	IPE	HAS	R	0	0	4	0	2	4	Nil
4.	23UC1202	English Proficiency	EP	HAS	R	0	0	4	0	2	4	Nil
5.	23UC1203	Design Thinking and Innovation	DTI	HAS	R	1	0	0	4	2	4	Nil
6.	23UC0010	Universal Human Values and Professional Ethics	UHV&PE	HAS	R	2	0	0	0	2	2	Nil
Total Credits (Humanities Arts & Social Sciences Courses)										**11**		
7.	22PY1106RBT/ RMT	Remedial Biology/Remedial Mathematics (Theory)	RBT/RM	BSC	R	2	0	0	0	2	2	Nil
8.	22PY1106RBP	Remedial Biology (Practical)	RBP	BSC	R	0	0	2	0	1	2	Nil
9.	22PY1211T	Computer Applications in Pharmacy (Theory)	CAP-T	BSC	R	3	0	0	0	3	3	Nil
10.	22PY1211P	Computer Applications in Pharmacy (Practical)	CAP-P	BSC	R	0	0	2	0	1	2	Nil
11.	22PY1212T	Environmental sciences (Theory)	ES	BSC	R	3	0	0	0	3	3	Nil

Total Credits (Basic Sciences Courses)										**9/10**		
12.	22PY1101T	Human Anatomy and Physiology I (Theory)	HAP I-T	PCC	R	3	1	0	0	4	4	Nil
13.	22PY1101P	Human Anatomy and Physiology I (Practical)	HAP I-P	PCC	R	0	0	4	0	2	4	Nil
14.	22PY1102T	Pharmaceutical Analysis (Theory)	PA-T	PCC	R	3	1	0	0	4	4	Nil
15.	22PY1102P	Pharmaceutical Analysis (Practical)	PA-P	PCC	R	0	0	4	0	2	4	Nil
16.	22PY1103T	Pharmaceutics (Theory)	PC-T	PCC	R	3	1	0	0	4	4	Nil
17.	22PY1103P	Pharmaceutics (Practical)	PC-P	PCC	R	0	0	4	0	2	4	Nil
18.	22PY1104T	Pharmaceutical Inorganic Chemistry (Theory)	PIC-T	PCC	R	3	1	0	0	4	4	Nil
19.	22PY1104P	Pharmaceutical Inorganic Chemistry (Practical)	PIC-P	PCC	R	0	0	4	0	2	4	Nil
20.	22PY1207T	Human Anatomy and Physiology II (Theory)	HAP II-T	PCC	R	3	1	0	0	4	4	HAP-I
21.	22PY1207P	Human Anatomy and Physiology II (Practical)	HAP II-P	PCC	R	0	0	4	0	2	4	HAP-I
22.	22PY1208T	Pharmaceutical Organic Chemistry I (Theory)	POC I-T	PCC	R	3	1	0	0	4	4	Nil
23.	22PY1208P	Pharmaceutical Organic Chemistry I (Practical)	POC I-P	PCC	R	0	0	4	0	2	4	Nil
24.	22PY1209T	Biochemistry (Theory)	BC-T	PCC	R	3	1	0	0	4	4	Nil
25.	22PY1209P	Biochemistry (Practical)	BC-P	PCC	R	0	0	4	0	2	4	Nil
26.	22PY1210T	Pathophysiology (Theory)	PATHO	PCC	R	3	1	0	0	4	4	Nil
27.	22PY2113T	Pharmaceutical Organic Chemistry II (Theory)	POC II-T	PCC	R	3	1	0	0	4	4	POC-I
28.	22PY2113P	Pharmaceutical Organic Chemistry II (Practical)	POC II-P	PCC	R	0	0	4	0	2	4	POC-I
29.	22PY2114T	Physical Pharmaceutics I (Theory)	PP I-T	PCC	R	3	1	0	0	4	4	Nil

30.	22PY2114P	Physical Pharmaceutics I (Practical)	PP I-P	PCC	R	0	0	4	0	2	4	Nil
31.	22PY2115T	Pharmaceutical Microbiology (Theory)	PMB-T	PCC	R	3	1	0	0	4	4	Nil
32.	22PY2115P	Pharmaceutical Microbiology (Practical)	PMB-P	PCC	R	0	0	4	0	2	4	Nil
33.	22PY2116T	Pharmaceutical Engineering (Theory)	PE-T	PCC	R	3	1	0	0	4	4	Nil
34.	22PY2116P	Pharmaceutical Engineering (Practical)	PE-P	PCC	R	0	0	4	0	2	4	Nil
35.	22PY2217T	Pharmaceutical Organic Chemistry III (Theory)	POC III-T	PCC	R	3	1	0	0	4	4	POC-II
36.	22PY2218T	Medicinal Chemistry I (Theory)	MC I-T	PCC	R	3	1	0	0	4	4	Nil
37.	22PY2218P	Medicinal Chemistry I (Practical)	MC I-P	PCC	R	0	0	4	0	2	4	Nil
38.	22PY2219T	Physical Pharmaceutics II (Theory)	PP II-T	PCC	R	3	1	0	0	4	4	PP-I
39.	22PY2219P	Physical Pharmaceutics II (Practical)	PP II-P	PCC	R	0	0	4	0	2	4	PP-I
40.	22PY2220T	Pharmacology I (Theory)	P. COL I-T	PCC	R	3	1	0	0	4	4	Nil
41.	22PY2220P	Pharmacology I (Practical)	P. COL I-P	PCC	R	0	0	4	0	2	4	Nil
42.	22PY2221T	Pharmacognosy and Phytochemistry I (Theory)	PH. COG I-T	PCC	R	3	1	0	0	4	4	Nil
43.	22PY2221P	Pharmacognosy and Phytochemistry I (Practical)	PH. COG I-P	PCC	R	0	0	4	0	2	4	Nil
44.	22PY3122T	Medicinal Chemistry II (Theory)	MC II-T	PCC	R	3	1	0	0	4	4	MC-I
45.	22PY3123T	Industrial Pharmacy I (Theory)	IP I-T	PCC	R	3	1	0	0	4	4	Nil
46.	22PY3123P	Industrial Pharmacy I (Practical)	IP I-P	PCC	R	0	0	4	0	2	4	Nil
47.	22PY3124T	Pharmacology II (Theory)	P. COL II-T	PCC	R	3	1	0	0	4	4	P. Col-I

48.	22PY3124P	Pharmacology II (Practical)	P. COL II-P	PCC	R	0	0	4	0	2	4	P. Col-I
49.	22PY3125T	Pharmacognosy and Phytochemistry II (Theory)	PH. COG II-T	PCC	R	3	1	0	0	4	4	P. Cog-I
50.	22PY3125P	Pharmacognosy and Phytochemistry II (Practical)	PH. COG II-P	PCC	R	0	0	4	0	2	4	P. Cog-I
51.	22PY3126T	Pharmaceutical Jurisprudence (Theory)	PJT	PCC	R	3	1	0	0	4	4	Nil
52.	22PY3227T	Medicinal Chemistry III (Theory)	MC III-T	PCC	R	3	1	0	0	4	4	MC-II
53.	22PY3227P	Medicinal chemistry III (Practical)	MC III-P	PCC	R	0	0	4	0	2	4	Nil
54.	22PY3228T	Pharmacology III (Theory)	P. COL III-T	PCC	R	3	1	0	0	4	4	P. Col-II
55.	22PY3228P	Pharmacology III (Practical)	P. COL III-P	PCC	R	0	0	4	0	2	4	P. Col-II
56.	22PY3229T	Herbal Drug Technology (Theory)	HDT-T	PCC	R	3	1	0	0	4	4	Nil
57.	22PY3229P	Herbal Drug Technology (Practical)	HDT-P	PCC	R	0	0	4	0	2	4	Nil
58.	22PY3230T	Biopharmaceutics and Pharmacokinetics (Theory)	BPPK	PCC	R	3	1	0	0	4	4	Nil
59.	22PY3231T	Pharmaceutical Biotechnology (Theory)	PBT	PCC	R	3	1	0	0	4	4	Nil
60.	22PY3232T	Quality Assurance (Theory)	QA	PCC	R	3	1	0	0	4	4	Nil
61.	22PY4133T	Instrumental Methods of Analysis (Theory)	IMA-T	PCC	R	3	1	0	0	4	4	Nil
62.	22PY4133P	Instrumental Methods of Analysis (Practical)	IMA-P	PCC	R	0	0	4	0	2	4	Nil
63.	22PY4134T	Industrial Pharmacy II (Theory)	IP II	PCC	R	3	1	0	0	4	4	Nil
64.	22PY4135T	Pharmacy Practice (Theory)	PH. PR	PCC	R	3	1	0	0	4	4	Nil

65.	22PY4136T	Novel Drug Delivery System (Theory)	NDDS	PCC	R	3	1	0	0	4	4	Nil
66.	22PY4137PS	Practice School	PS	PCC	R	0	0	12	0	6	12	Nil
67.	22PY4238T	Biostatistics and Research Methodology (Theory)	BSRM	PCC	R	3	1	0	0	4	4	Nil
68.	22PY4239T	Social and Preventive Pharmacy (Theory)	SPP	PCC	R	3	1	0	0	4	4	Nil
Total Credits (Professional Core Courses)										**186**		
69.	PEC 1	Professional Elective Course 1	PEC I	PEC	R	3	1	0	0	4	4	Nil
70.	PEC 2	Professional Elective Course 2	PEC II	PEC	R	3	1	0	0	4	4	Nil
Total Credits (Professional Elective Courses)										**8**		
71.	OEC I	Open Elective Course 1	OEC I	OEC	R	2	0	2	0	3	4	Nil
72.	OEC II	Open Elective Course 2	OEC II	OEC	R	2	0	2	0	3	4	Nil
73.	OEC III	Open Elective Course 3	OEC III	OEC	R	2	0	2	0	3	4	Nil
Total Credits (Open Elective Courses)										**9**		
74.	22PY3123S	Production process for API/Bulk drug/Intermediates	PPA	SDC	R	0	0	0	4	1	4	Nil
75.	22PY4133S	Operation of Analytical Instruments	OAI	SDC	R	0	0	0	4	1	4	Nil
Total Credits (Skill Development Courses)										**2**		
76	22PY4250PW	Project Work	PW	PRI	R	0	0	12	0	6	12	Nil
Total Credits (Project Work)										**6**		
Grand Total										**231/232**		

List of Electives												
1.	22PY240ET	Pharma Marketing Management	PMM	PEC I	R	3	1	0	0	4	4	Nil
2.	22PY4242ET	Pharmacovigilance	PV		R							Nil
3.	22PY4243ET	Quality Control and Standardization of Herbals	QCSH		R							Nil
4.	22PY4246ET	Cosmetic Science	CS		R							Nil
5.	22PY4248ET	Advanced Instrumentation Techniques	AIT		R							Nil
6.	22PY4241ET	Pharmaceutical Regulatory Science	PRS	PEC II	R	3	1	0	0	4	4	Nil
7.	22PY4244ET	Computer Aided Drug Design	CADD		R							Nil
8.	22PY4245ET	Cell and Molecular Biology	CMB		R							Nil
9.	22PY4247ET	Experimental Pharmacology	EP		R							Nil
10.	22PY4249ET	Dietary Supplements and Nutraceuticals	DSN		R							Nil
11.	OEGN0001/04	National Caded Cops (NCC)-I/NSS-I	(NCC)-I/NSS-I	OEC I	R	2	0	2	0	3	4	Nil
12.	OEGN0002/05	National Caded Cops (NCC)-II/NSS-2	(NCC)-II/NSS-2	OEC II	R	2	0	2	0	3	4	Nil
13.	OEGN0003/06	National Caded Cops-III/NSS-III	(NCC)-III/NSS-3	OEC III	R	2	0	2	0	3	4	Nil

CHAPTER 12

ARTICULATION MATRIX

Program Articulation Matrix

S.No.	Course Code	Course Name	Category	L	T	P	S	Cr	PO												PSO	
									1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	22PY1101T	Human Anatomy and Physiology I (Theory)	PC	3	1	0	0	4	2													
2.	22PY1101P	Human Anatomy and Physiology I (Practical)	PC	0	0	4	0	2	2			2										
3.	22PY1102T	Pharmaceutical Analysis I (Theory)	PC	3	1	0	0	4	2			2									1	
4.	22PY1102P	Pharmaceutical Analysis I (Practical)	PC	0	0	4	0	2	2			2									1	
5.	22PY1103T	Pharmaceutics (Theory)	PC	3	1	0	0	4	3			2									2	
6.	22PY1103P	Pharmaceutics (Practical)	PC	0	0	4	0	2		3											2	
7.	22PY1104T	Pharmaceutical Inorganic Chemistry (Theory)	PC	3	1	0	0	4	2													
8.	22PY1104P	Pharmaceutical Inorganic Chemistry (Practical)	PC	0	0	4	0	2	3													
9.	22PY1105T	Communication skills * (Theory)	HSS	2	0	0	0	2	2										2			
10.	22PY1105P	Communication skills* (Practical)	HSS	0	0	2	0	1	3										3			
11.	22PY1106RBT/	Remedial Biology/Remedial Mathematics* (Theory)	BS	2	0	0	0	2	1													

	22PY1106RMT																						
12.	22PY1106RBP	Remedial Biology* (Practical)	BS	0	0	2	0	2			2												
13.	22PY1207T	Human Anatomy and Physiology II (Theory)	PC	3	1	0	0	4	3														
14.	22PY1207P	Human Anatomy and Physiology II (Practical)	PC	0	0	4	0	2		2		2											
15.	22PY1208T	Pharmaceutical Organic Chemistry I (Theory)	PC	3	1	0	0	4	2			2											
16.	22PY1208P	Pharmaceutical Organic Chemistry I (Practical)	PC	0	0	4	0	2	2			2											
17.	22PY1209T	Biochemistry (Theory)	PC	3	1	0	0	4	2			2											
18.	22PY1209P	Biochemistry (Practical)	PC	0	0	4	0	2	2			2											
19.	22PY1210T	Pathophysiology (Theory)	PC	03	1	0	0	4	2			2											
20.	22PY1211T	Computer Applications in Pharmacy* (Theory)	BSS	3	0	0	0	3					2										1
21.	22PY1211P	Computer Applications in Pharmacy* (Practical)	BSS	0	0	2	0	1			3		3										1
22.	23UC1101	Integrated Professional English	HSS	0	0	4	0	2									2	2					
23.	22PY1212T	Environmental sciences * (Theory)	BSS	3	0	0	0	3							2								
24.	22PY2113T	Pharmaceutical Organic Chemistry II (Theory)	PC	3	1	0	0	4	2														
25.	22PY2113P	Pharmaceutical Organic Chemistry II (Practical)	PC	0	0	4	0	2		2		2											

26.	22PY2114T	Physical Pharmaceutics I (Theory)	PC	3	1	0	0	4	2														
27.	22PY2114P	Physical Pharmaceutics I (Practical)	PC	0	0	4	0	2			3												
28.	22PY2115T	Pharmaceutical Microbiology (Theory)	PC	3	1	0	0	4	2			2											
29.	22PY2115P	Pharmaceutical Microbiology (Practical)	PC	0	0	4	0	2		3													
30.	22PY2116T	Pharmaceutical Engineering (Theory)	PC	3	1	0	0	4	2														
31.	22PY2116P	Pharmaceutical Engineering (Practical)	PC	0	0	4	0	2	2														
32.	23UC1202	English Proficiency	HSS	0	0	4	0	2						2									
33.	23UC1203	Design Thinking and Innovation	HSS	0	0	4	0	2		1	1		2	1	2	1							
34.	22PY2217T	Pharmaceutical Organic Chemistry III (Theory)	PC	3	1	0	0	4				2											
35.	22PY2218T	Medicinal Chemistry I (Theory)	PC	3	1	0	0	4	2			2											
36.	22PY2218P	Medicinal Chemistry I (Practical)	PC	0	0	4	0	2	2			2											
37.	22PY2219T	Physical Pharmaceutics II (Theory)	PC	3	1	0	0	4	2			2											
38.	22PY2219P	Physical Pharmaceutics II (Practical)	PC	0	0	4	0	2			3												
39.	22PY2220T	Pharmacology I (Theory)	PC	3	1	0	0	4	3			2											
40.	22PY2220P	Pharmacology I (Practical)	PC	0	0	4	0	2	2			2											
41.	22PY2221T	Pharmacognosy and Phytochemistry I (Theory)	PC	3	1	0	0	4	2	1													1
42.	22PY2221P	Pharmacognosy and Phytochemistry I (Practical)	PC	0	0	4	0	2				2											1
43.	22PY3122T	Medicinal Chemistry II (Theory)	PC	3	1	0	0	4	2														

44.	22PY3123T	Industrial Pharmacy I (Theory)	PC	3	1	0	0	4		2												2
45.	22PY3123P	Industrial Pharmacy I (Practical)	PC	0	0	4	0	2		2		3										2
46.	22PY3124T	Pharmacology II (Theory)	PC	3	1	0	0	4	2			2										
47.	22PY3124P	Pharmacology II (Practical)	PC	0	0	4	0	2		2	3											
48.	22PY3125T	Pharmacognosy and Phytochemistry II (Theory)	PC	3	1	0	0	4	2	2												1
49.	22PY3125P	Pharmacognosy and Phytochemistry II (Practical)	PC	0	0	4	0	2	2	2												1
50.	22PY3126T	Pharmaceutical Jurisprudence (Theory)	PC	3	1	0	0	4	2													
51.	22PY3123S	Production Process for API/Bulk drug / Intermediates	Skill	0	0	0	4	1				3										
52.	22PY3227T	Medicinal Chemistry III (Theory)	PC	3	1	0	0	4	2			2										
53.	22PY3227P	Medicinal chemistry III (Practical)	PC	0	0	4	0	2				2										
54.	22PY3228T	Pharmacology III (Theory)	PC	3	1	0	0	4	2			2										
55.	22PY3228P	Pharmacology III (Practical)	PC	0	0	4	0	2	2			2										
56.	22PY3229T	Herbal Drug Technology (Theory)	PC	3	1	0	0	4	2			2									2	
57.	22PY3229P	Herbal Drug Technology (Practical)	PC	0	0	4	0	2	2	3											3	
58.	22PY3230T	Biopharmaceutics and Pharmacokinetics (Theory)	PC	3	1	0	0	4		2												
59.	22PY3231T	Pharmaceutical Biotechnology (Theory)	PC	3	1	0	0	4	2			2										
60.	22PY3232T	Quality Assurance (Theory)	PC	3	1	0	0	4	2													

61.	22PY4133T	Instrumental Methods of Analysis (Theory)	PC	3	1	0	0	4	2			2											
62.	22PY4133P	Instrumental Methods of Analysis (Practical)	PC	0	0	4	0	2	2			2											
63.	22PY4134T	Industrial Pharmacy II (Theory)	PC	3	1	0	0	4	2			2											
64.	22PY4135T	Pharmacy Practice (Theory)	PC	3	1	0	0	4	2			2			2			2					
65.	22PY4136T	Novel Drug Delivery System (Theory)	PC	3	1	0	0	4	2			2											2
66.	23UC0010	Universal Human values and Professional Ethics	HSS	2	0	0	0	2								3							
67.	22PY4137PS	Practice School*	PC	0	0	12	0	6	2					2	2	3					3		
68.	22PY4133S	Operations of Analytical Instruments	Skill	0	0	0	4	1				3											
69.	22PY4238T	Biostatistics and Research Methodology (Theory)	PC	3	1	0	0	4	2			2											
70.	22PY4239T	Social and Preventive Pharmacy (Theory)	PC	3	1	0	0	4	2					2		2							
71.	22PY4240ET	Pharma Marketing Management (Theory)	PE	3	1	0	0	4	2			2											2
72.	22PY4241ET	Pharmaceutical Regulatory Science (Theory)	PE	3	1	0	0	4	2			2											
73.	22PY4242ET	Pharmacovigilance (Theory)	PE	3	1	0	0	4	2			2											2
74.	22PY4243ET	Quality Control and Standardization of Herbals (Theory)	PE	3	1	0	0	4	2			2											
75.	22PY4244ET	Computer Aided Drug Design (Theory)	PE	3	1	0	0	4	2			2											2

76.	22PY4245ET	Cell and Molecular Biology (Theory)	PE	3	1	0	0	4	2			2												
77.	22PY4246ET	Cosmetic Science (Theory)	PE	3	1	0	0	4	2			2												2
78.	22PY4247ET	Experimental Pharmacology (Theory)	PE	3	1	0	0	4	2			2								2				
79.	22PY4248ET	Advanced Instrumentation Techniques	PE	3	1	0	0	4	2			2												
80.	22PY4249ET	Dietary Supplements and Neutraceuticals	PE	3	1	0	0	4	2															
81.	22PY4250ET	Project work	PW	3	1	0	0	4		3		3			2	2								

Course Articulation Matrix

S No	Course Code	Course Title	CO NO	Description of the Course Outcome	Program Outcomes												PSO	
					1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	22PY1101T	HUMAN ANATOMY AND PHYSIOLOGY-I (THEORY)	CO1	Understand the gross morphology	2													
			CO2	Understanding anatomy and physiological concepts	2													
			CO3	Understanding physiology of body fluids	2													
			CO4	Understand the gross morphology of PNS	2													
2	22PY1101P	HUMAN ANATOMY AND PHYSIOLOGY-I (PRACTICAL)	CO1	To identify the gross anatomy and functions of microscope, connective tissues, skeletal system, and understanding and performance of bleeding and clotting time.	2				2									
			CO2	To understand and performs the blood group analysis, ESR rate, heart rate, pulse, BP, and measurement of haemoglobin, RBC, and WBC counts.	2				2									
3	22PY1102T	PHARMACEUTICAL ANALYSIS (THEORY)	CO1	Understand the principles of volumetric and electro chemical analysis	1				2									
			CO2	Understand the theories and classifications of volumetric titrations	2				2									
			CO3	Understanding the Importance of complexometry, masking and demasking agents. Concepts of Redox-titrations.	2				2									
			CO4	Understanding the concepts of electrochemical methods for analysis	2				2									
4	22PY1102P	PHARMACEUTICAL ANALYSIS (PRACTICAL)	CO1	Determining the exact amount and concentration of chemical substances	2				2									
			CO2	Determining the exact amount, concentration and normality of chemical substances	2				2									
5	22PY1103T	PHARMACEUTICS (THEORY)	CO1	Understand the history and development of profession of pharmacy	2				2									
			CO2	Apply the knowledge on pharmaceutical calculations	2				2									

			CO3	Understand the principles involved in the formulation development	2			2										
			CO4	Understand the principles involved in the formulation development of semisolid dosage forms	2			2										
6	**22PY1103P**	**PHARMACEUTICS (PRACTICAL)**	CO1	Classifying various solid and liquid dosage forms, preparation and dispensing of ORS powder, effervescent granules, dusting powders, powders, Syrups, Elixirs, Linctus, Solutions, Gargles and Mouthwashes		3												
			CO2	Classification of Biphasic liquid dosage forms and semi solid dosage forms, preparing and dispensing of Suspensions, Emulsions, suppositories, ointments and gels		3											2	
7	**22PY1104T**	**PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)**	CO1	Understand inorganic compounds, sources of Impurities and test for purity of Impurities	2													
			CO2	Understand the monograph study of various inorganic compounds	2													
			CO3	Understand the monograph study of various inorganic compounds belongs to Dental products & Gastro-intestinal agents	2													
			CO4	Understand the monograph study of various inorganic compounds belongs to Miscellaneous agents & Radiopharmaceuticals	2													
8	**22PY1104P**	**PHARMACEUTICAL INORGANIC CHEMISTRY (PRACTICAL)**	CO1	Test for "Limit tests "for the ions and Identification tests	3													
			CO2	Determination of purity of various inorganic compounds and preparation of inorganic pharmaceuticals	2													
9	**22PY1105T**	**COMMUNICATION SKILLS (THEORY)**	CO1	Apply the practical knowledge of using action words in sentenceconstruction	1			1										
			CO2	Apply and analyse the right kind of pronunciation with regards to speech sounds and able to get different types of pronunciations.	1			1		3								
			CO3	Apply the concept of fundamental principle of counting to solvethe problems	1			1		3								
			CO4	Analyze the given conditions and finding out all the possible arrangements in linear & circular order	1			1		3								

10	**22PY1105P**	**COMMUNICATION SKILLS (PRACTICAL)**	CO1	Apply the practical of basic communication and analyze the pronunciations	1					3									
			CO2	Applying the concept of probability and Analyzing the given conditions and finding out all the possible arrangements in linear & circular order.						3									
11	**22PY1106RBT**	**REMEDIAL BIOLOGY (THEORY)**	CO1	Introduce biology to non-biology students	1														
			CO2	Know the classification and salient features of five kingdoms of life	1														
			CO3	Understand the basic components of anatomy & physiology of plant	1														
			CO4	Understand the basic components of anatomy & physiology animal	1														
12	**22PY1106RBP**	**REMEDIAL BIOLOGY (PRACTICAL)**	CO1	Demonstration of experiments in biology and application of In silico models to demonstrate experiments on frog		2													
			CO2	Identification of tissues and Determination of BP, Blood group and TV				3											
13	**22PY1106RMT**	**REMEDIAL MATHEMATICS (THEORY)**	CO1	Understand the essentials of mathematics	2			2											
			CO2	Know theory and applications of Mathematics	2			2											
			CO3	Solve problems applying theoretical concepts	2			2											
			CO4	Application of Pharmacy in Life sciences	3			2											
14	**22PY1207T**	**HUMAN ANATOMY AND PHYSIOLOGY-II (THEORY)**	CO1	Understand the gross morphology, structure and functions of Central Nervous system and Brain	3														
			CO2	Understand the gross morphology, structure and functions of digestive system.	3														
			CO3	Understand the gross morphology, structure and functions of respiratory and urinary system.	3														
			CO4	Understand the gross morphology, structure and functions of endocrine and reproductive system	3														
15	**22PY1207P**	**HUMAN ANATOMY AND PHYSIOLOGY-II (PRACTICAL)**	CO1	Demonstrate the gross anatomy and functions of nervous, endocrine, integumentary and special senses, functions of the olfactory nerve, neurological, visual and reflesx activity; Applying the skills and knowledge required to perform laboratory experiments safely with appropriate equipment.	3				3										
			CO2	Demonstration on positive and negative feedback mechanism, body temperature, tidal volume and vital	3				3										

				capacity, basal mass index, total blood count by cell analyser, basal mass index, total blood count by cell analyser.														
16	**22PY1208T**	**PHARMACEUTICAL ORGANIC CHEMISTRY I (THEORY)**	CO1	Understand the structure, name and the type of isomerism of the organic compound	2			2										
			CO2	Understand the name of the reaction and orientation of reactions	2			2										
			CO3	Understand the reactivity /stability of compound	2			2										
			CO4	Understand the Named reactions in Organic chemistry	2			2										
17	**22PY1208P**	**PHARMACEUTICAL ORGANIC CHEMISTRY I (PRACTICAL)**	CO1	Test for organic compounds, detection of elements and their functional groups				2										
			CO2	Identification of unknown compounds and preparation of derivatives	2			2										
18	**22PY1209T**	**BIOCHEMISTRY (THEORY)**	CO1	Understand The Principles of Chemistry in biology	2			2										
			CO2	Understand the catalytic role of enzymes	2			2										
			CO3	Understand the metabolism of nutrient molecules in physiological and pathological conditions	2			2										
			CO4	Understand the genetic organization of mammalian genome	2			2										
19	**22PY1209P**	**BIOCHEMISTRY (PRACTICAL)**	CO1	Qualitative and quantitative analysis of carbohydrates, proteins cholesterol, measurement of pH and blood cholesterol		2												
			CO2	Preparation of buffer solutions, Enzymatic hydrolysis of biomolecules and salivary enzyme activity.		2												
20	**22PY1210T**	**PATHOPHYSIOLOGY (THEORY)**	CO1	Understand the conditions leading to a disease	2			2										
			CO2	Understand the mechanism of inflammation	2			2										
			CO3	Understand the etiology and pathogenesis of the selected disease states	2			2										
			CO4	Understanding the principles of selected diseases	2			2										
21	**22PY1211T**	**COMPUTER APPLICATIONS IN PHARMACY (THEORY)**	CO1	Apply the knowledge of Numbering system and its calculations Understand the concepts of Information System and software				2										
			CO2	Apply the knowledge using HTML, XML, CSS, MS access languages. Understand the concepts of web technologies					2									

			CO3	Understand the various types of application of computers in pharmacy					3									
			CO4	Applying knowledge on Data analysis in preclinical development Understand the concept of Bioinformatics					3									
22	**22PY1211P**	**COMPUTER APPLICATIONS IN PHARMACY (PRACTICAL)**	CO1	Apply knowledge on creating a HTML web page to show personal information. Understand to Design a questionnaire using a word processing package to gather information about a particular disease. Know to retrieve the information of a drug and its adverse effects using online tools; Apply knowledge on creating mailing labels Using Label Wizard, generating label in MSWORD, create a database in MS Access to store the patient information with the required fields Using access, design a form in MS Access to view, add, delete and modify the patient recording the database		3												
			CO2	Apply knowledge for Drug information storage and retrieval using MS Access. Understand to generating report and printing the report from the patient database 8 Creating invoice table using – MS Access; Apply knowledge Creating and working with queries in MS Access, Exporting Tables, Queries, Forms and Reports to web page, Exporting Tables, Queries, Forms and Reports to XML pages		3												
23	**22PY1212T**	**ENVIRONMENTAL SCIENCES (THEORY)**	CO1	Understand the importance of Environmental education and conservation of natural resources							2							
			CO2	Understand the importance of renewable natural resources							2							
			CO3	Understand the importance of ecosystems and biodiversity							2							
			CO4	Understand the environmental science knowledge on solid waste management, disaster management and EIA process							2							
24	**23UC1101**	**INTEGRATED PROFESSIONAL ENGLISH**	CO1	Understanding the language Mechanics in Basic Grammar & Interactive Listening & Speaking								2						
			CO2	Applying Integrated Reading skills & Techniques of Writing								3						
	22PY2113T		CO1	Understand Aromatic nature and type of chemical reactions of organic compound	2													

25		**PHARMACEUTICAL ORGANIC CHEMISTRY –II (THEORY)**	CO2	Understand account for reactivity of Polycyclic Aromatic compounds and different Strain theories	2													
			CO3	Understand the preparation and properties of aromatic compounds	2													
			CO4	Application of SAR on medical uses of selected drugs				2										
26	**22PY2113P**	**PHARMACEUTICAL ORGANIC CHEMISTRY –II (PRACTICAL)**	CO1	Preparation of some organic compounds using different types of reactions		2												
			CO2	Determination of quality of various oils by Acid value, Saponification value, and Iodine value and discuss the purification techniques and their importance in chemistry		2												
27	**22PY2114T**	**PHYSICAL PHARMACEUTICS-I (THEORY)**	CO1	Understand the Solubility of drugs and mechanisms of solute solvent interactions	2													
			CO2	Understand the Principles involved in States of Matter and properties of matter and Physicochemical properties of drug molecules	2													
			CO3	Understand the Concepts involved in Surface and interfacial phenomenon.	2													
			CO4	Application of Complexation and protein binding and determination of PH in biological systems	2													
28	**22PY2114P**	**PHYSICAL PHARMACEUTICS-I (PRACTICAL)**	CO1	Application of several Principles involved in States of Matter and properties of matter and Physicochemical properties of drug molecules and interactions of various substances and various factors that influence the Solubility of drugs and mechanisms of solute-solvent interactions	3													
			CO2	Applying Concepts involved in Surface and interfacial phenomenon, Complexation and protein binding and determination of PH in biological systems	3													
29	**22PY2115T**	**PHARMACEUTICAL MICROBIOLOGY (THEORY)**	CO1	Understand methods of identification, cultivation and preservation of various microorganisms	2			2										
			CO2	Understand the importance and implementation of sterilization in pharmaceutical processing and industry	2			2										
			CO3	Understand sterility testing of pharmaceutical products	2			2										
			CO4	Understand microbiological standardization of Pharmaceuticals.	2			2										

30	**22PY2115P**	**PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)**	CO1	Study of different equipments used in experimental microbiology, to perform the preparation of culture media and sterilization of glassware. Applying the knowledge of sterilization techniques and isolation of Pure Cultures		3												
			CO2	Applying the knowledge of sterilization techniques and isolation of Pure CulturesTo apply the staining techniques of bacteria, demonstration of bacterial motility by hanging drop technique. To perform the microbiological assays of antibiotics, sterility testing of pharmaceuticals, biochemical tests of Microorganisms		3												
31	**22PY2116T**	**PHARMACEUTICAL ENGINEERING (THEORY)**	CO1	Understand the concept of flow of fluids and various principles and equipment involved in size separation and size reduction techniques		2												
			CO2	Understand the concept of Heat transfer and principles and equipment involved in evaporation and distillation		2												
			CO3	Apply the concepts of drying and mixing in operation of pharmaceutical manufacturing dosage forms		2												
			CO4	Understand various materials involved in pharmaceutical manufacturing process		2												
32	**22PY2116P**	**PHARMACEUTICAL ENGINEERING (PRACTICAL)**	CO1	To know various unit operations used in pharmaceutical industries and material handling techniques		2												
			CO2	Understand various processes involved in pharmaceutical manufacturing process and acquiring knowledge on operation of pharmaceutical manufacturing equipment		2												
33	**23UC1202**	**ENGLISH PROFICIENCY**	CO1	Understanding Language Mechanics in advanced Grammar and advanced Communicative Listening & Speaking									2	2				
			CO2	Applying the advanced Reading techniques and Advanced Techniques of Writing									2	2				
34	**23UC1203**	**DESIGN THINKING AND INNOVATION**	CO1	Understand the importance of Design thinking mindset for identifying contextualized problems	2													
			CO2	Analyze the problem statement by empathizing with user		2												
			CO3	Develop ideation and test the prototypes made				2	2						2			
			CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity			2						2					
	22PY2217T		CO1	Describes stereoisomerism and racemic modification of compound	2													

35		**PHARMACEUTICAL ORGANIC CHEMISTRY III (THEORY)**	CO2	Account for stereo specific reactions and its nomenclature of given organic compounds	2													
			CO3	Detail study of Heterocyclics, its nomenclature, synthesis and its reactions				2										
			CO4	Description of preparative methods, medicinal uses of heterocyclic drugs and Study of Named reactions.				2										
36	**22PY2218T**	**MEDICINAL CHEMISTRY I (THEORY)**	CO1	Understand the correlation of pharmacology of a disease with physico-chemical properties of drugs	2													
			CO2	Understand the chemistry, metabolic pathways, structure activity relationship and therapeutic value of adrenergic drugs	2			2										
			CO3	Understand the chemistry, metabolic pathways, structure activity relationship and therapeutic value of cholinergic drugs	2			2										
			CO4	Understand the chemistry, metabolic pathways, structure Activity relationship and therapeutic value of CNS drugs	2			2										
37	**22PY2218P**	**MEDICINAL CHEMISTRY I (PRACTICAL)**	CO1	Perform chemical synthesis of some drugs; Perform chemical synthesis of some intermediates in chemical reactions				2										
			CO2	Perform the assays for few drugs to identify its purity; Determination of a physical property, partition coefficient for few drugs				2										
38	**22PY2219T**	**PHYSICAL PHARMACEUTICS II (THEORY)**	CO1	Understand the principles of physical chemistry in pharmaceutical technology	2			2										
			CO2	Understand various physicochemical properties of drug molecules in the designing the dosage forms	2			2										
			CO3	Understand the use of physicochemical properties in the formulation development and evaluation of dosage forms.	2			2										
			CO4	Understand the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations	2			2										
39	**22PY2219P**	**PHYSICAL PHARMACEUTICS II (PRACTICAL)**	CO1	Apply the principles of colloidal systems and their properties and rheological behaviour of pharmaceutical systems and physical parameters in designing of dispersed systems	3													
			CO2	Apply the principles of particle surface characteristics in	3													

				study of powdered materials and application of these concepts in designing of dosage forms and the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations															
40	**22PY2220T**	**PHARMACOLOGY I (THEORY)**	CO1	Understanding the pharmacological actions of different categories of drugs	3			2											
			CO2	Understand the mechanism of drug action at the organ system/subcellular/macromolecular level	3			2											
			CO3	Applying the basic knowledge of pharmacology in PNS	3			2											
			CO4	Applying the effect of drugs on CNS	3			2											
41	**22PY2220P**	**PHARMACOLOGY I (PRACTICAL)**	CO1	Application of basic principles of pharmacology and common laboratory techniques		2													
			CO2	Examining drugs using pharmacological equipments(In silico) and Analysing the effect of drugs on stereotype and catatonic activity			3												
42	**22PY2221T**	**PHARMACOGNOSY AND PHYTOCHEMISTRY I (THEORY)**	CO1	To know the knowledge of crude drugs and its evaluation	2														
			CO2	To know about the cultivation, collection and processing of crude drugs	1														
			CO3	Know about the traditional systems of medicine and a brief introduction about secondary metabolites	1														
			CO4	Know about the primary metabolites and marine source of drugs	1														
43	**22PY2221T**	**PHARMACOGNOSY AND PHYTOCHEMISTRY I (PRACTICAL)**	CO1	Applying the knowledge of chemical evaluation in identifying and physical evaluation of crude drugs	2												2		
			CO2	Applying the knowledge of microscopical evaluation of crude drugs by linear measurements and leaf constants	2												2		
44	**22PY3122T**	**MEDICINAL CHEMISTRY II (THEORY)**	CO1	Understanding the nomenclature, chemistry, metabolism, structure-activity relationship, mechanism of action, synthesis (few drugs	2														
			CO2	Understanding the nomenclature, chemistry, metabolism, structure-activity relationship, mechanism of action, synthesis (few drugs) and uses of anti-anginal, Antihypertensive and diuretic drugs	2														
			CO3	Applying the knowledge of the nomenclature, chemistry, metabolism, structure-activity relationship, mechanism of action, synthesis (few drugs) and uses of	2														

				Anti-arrhythmic drugs														
			CO4	Applying the knowledge of the nomenclature, chemistry, metabolism, structure-activity relationship, mechanism of action, synthesis (few drugs) and uses of Antidiabetic drugs, hormones and steroid drugs	2													
45	**22PY3123T**	**INDUSTRIAL PHARMACY I (THEORY)**	CO1	Understand about Physicochemical properties of drug that influences the performance of drug and dosage from		2												2
			CO2	Understand the formulation, manufacturing, evaluation of tablets, liquid orals, capsules and pelletization.		2												
			CO3	Understand different considerations related to parenterals and ophthalmic products		2												
			CO4	Apply the formulation, preparation and evaluation of cosmetics and aerosols. A note on packaging materials for pharmaceutical products		2												
46	**22PY3123P**	**INDUSTRIAL PHARMACY I (PRACTICAL)**	CO1	Know about Physicochemical properties of drug that influences the performance of drug and dosage from, Applying the preparation and evaluation of capsules and coated tablets.		2												2
			CO2	Analysing the preparation and evaluation of injections, evaluation of creams.			2											2
47	**22PY3124T**	**PHARMACOLOGY II (THEORY)**	CO1	Understanding Pharmacology of cardio vascular system drugs: congestive heart failure drugs, Anti-hypertensive drugs, Anti-anginal drugs, Anti-arrhythmic drugs, Anti-hyperlipidemic drugs	2													
			CO2	Understanding the pharmacology of shock, Hematinics, coagulants and anticoagulants, Fibrinolytics and anti-platelet drugs, diuretics and autocoids	2													
			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													
			CO4	Applying the principles of Bio-Assays	2			2										
48	**22PY3124P**	**PHARMACOLOGY II (PRACTICAL)**	CO1	Analysing the pharmacological activity of drugs on Cardiac and Renal system and dose responses on isolated tissues (Insilco		2												

			CO2	Examining the potency of drugs by Bioassays and Analysing the effect of drugs on analgesic and inflammation			2												
49	22PY3125T	PHARMACOGNOSY AND PHYTOCHEMISTRY II (THEORY)	CO1	Understand the importance of the basic metabolic pathways occurring in higher plants	2														
			CO2	Understand the importance of biological sources of various crude drugs	2														
			CO3	Understand the extraction procedures of crude drugs		2													
			CO4	Production of the phytoconstituents and identification of it.		2													
50	22PY3125P	PHARMACOGNOSY AND PHYTOCHEMISTRY II (PRACTICAL)	CO1	Identification of phytoconstituents in the crude drug by chemical tests			2												
			CO2	Isolation and detection of Phytoconstituents from crude drugs			2												
51	22PY3126T	PHARMACEUTICAL JURISPRUDENCE (THEORY)	CO1	Understanding the Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.	2														
			CO2	Understanding Various Indian pharmaceutical Acts and Laws	2														
			CO3	Understanding the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals								2							
			CO4	Understanding the code of ethics during the pharmaceutical practice								3							
52	22PY3123S	PRODUCTION PROCESS FOR API/BULK DRUG/INTERMEDIATES	CO1	Application of various unit operations and design and working of equipment used for the unit operations		3													
			CO2	Perform and evaluate various preformulation studies for API and analyze the behavior of API		3											3		
			CO3	Determine different degradative reactions of API and evaluate the nature of degradation		3													
			CO4	Operate and perform various exercises on various equipment used in the manufacturing process		3											3		
53	22PY3227T	MEDICINAL CHEMISTRY III (THEORY)	CO1	Understand the importance of drug design and different techniques of drug design	2			2											
			CO2	Understand the chemistry of drugs with respect to their biological activity	2			2											

			CO3	Understanding the metabolism, adverse effects &therapeutic value of drugs.	2			2										
			CO4	Applying the concepts of SAR of drugs	2			2										
54	**22PY3227P**	**MEDICINAL CHEMISTRY III (PRACTICAL)**	CO1	Preparation of drugs and intermediates, Assay of drugs, Preparation of medicinally important compounds or intermediates by Microwave irradiation technique		2												
			CO2	Drawing structures and reactions using chem draw® Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)		2												
55	**22PY3228T**	**PHARMACOLOGY III (THEORY)**	CO1	Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases	2			2										
			CO2	Comprehend the principles of toxicology and treatment of various poisonings	2			2										
			CO3	Appreciate correlation of pharmacology with related medical sciences	2			2										
			CO4	Applying the concepts of pharmacodynamics of medicinal agents	2			2										
56	**22PY3228P**	**PHARMACOLOGY III (PRACTICAL)**	CO1	Obtain 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		2												
			CO2	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.		2												
57	**22PY3229T**	**HERBAL DRUG TECHNOLOGY (THEORY)**	CO1	Apply the knowledge on formulation of Ayurvedic dosage form understand raw material as source of herbal drugs from cultivation to herbal drug product				2										
			CO2	Understand the concept of Nutraceuticals and their role in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastrointestinal diseases				2										

			CO3	Apply the knowledge on formulation of Herbal Cosmetics using Herbal excipients				2											
			CO4	Understand the WHO and ICH guidelines for evaluation of herbal drugs. Understand Regulatory Issues -Regulations in India and Schedule T				2											
58	**22PY3229P**	**HERBAL DRUG TECHNOLOGY (PRACTICAL)**	CO1	Test for preliminary phytochemical screening and determination of phytochemical constituents			2												
			CO2	Evaluation of natural origins and application of herbal products in cosmetics		2													
59	**22PY3230T**	**BIOPHARMACEUTICS AND PHARMACOKINETICS (THEORY)**	CO1	Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance	2														
			CO2	To understand the concepts of bioavailability and bioequivalence of drug products and their significance	2														
			CO3	Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.	2														
			CO4	Understand various pharmacokinetic parameters, their significance & applications.	2														
60	**22PY3231T**	**PHARAMCEUTICAL BIOTECHNOLOGY (THEORY)**	CO1	Understanding the importance of Immobilized enzymes in Pharmaceutical Industries	2			2											
			CO2	Applications of genetic engineering in relation to production of pharmaceuticals	2			2											
			CO3	Understanding Importance of Monoclonal antibodies in Industries	2			2											
			CO4	Appreciate the use of microorganisms in fermentation technology	2			2											
61	**22PY3232T**	**QUALITY ASSURANCE (THEORY)**	CO1	Understand the importance of quality assurance in Production of quality pharmaceutical production industry	2												2		
			CO2	Understand the importance of good manufacturing Practices in a pharmaceutical industry	2												2		
			CO3	Understand the importance of good laboratory practices in a pharmaceutical industry	2												2		
			CO4	Applying the concepts of documentation and validation	2												2		
	22PY4133T	**INSTRUMENTAL METHOD OF ANALYSIS (THEORY)**	CO1	Know about various instruments and standard operating procedures	2			2											

62			CO2	Understand the interaction of matter with electromagneticradiations and its applications in drug analysis	2			2											
			CO3	Understand the chromatographic separation and analysis of drugs.	2			2											
			CO4	Understand the principle and application of advanced analytical instruments.	2			2											
63	**22PY4133P**	**INSTRUMENTAL METHOD OF ANALYSIS (PRACTICAL)**	CO1	Estimation of samples by using UV, Colorimetry, Fluorimetry		2		3											
			CO2	Estimation of samples by using Flame photometry, Nephelo turbidometry, paper chromatography, thin layer chromatography, column chromatography, HPLC, Gas Chromatography		2		3											
64	**22PY4134T**	**INDUSTRIAL PHARMACY II (THEORY)**	CO1	Understand the process of pilot plant and scale up of pharmaceutical dosage forms	2			2									2		
			CO2	Understand the process of technology transfer from lab scale to commercial batch	2			2									2		
			CO3	Understand different Laws and Acts that regulate pharmaceutical industry	2			2									2		
			CO4	Application of the approval process and regulatory requirements for drug products	2			2									2		
65	**22PY4135T**	**PHARMACY PRACTICE (THEORY)**	CO1	Understand various drug distribution methods in a hospital	2			2											
			CO2	Appreciate the pharmacy stores management and inventory control	2			2											
			CO3	Examining patient drug therapy	2			2											
			CO4	Application of communication skills in patient counselling	2			3											
66	**22PY4136T**	**NOVEL DRUG DELIVERY SYSTEMS (THEORY)**	CO1	Understand the Various approaches of controlled drug delivery system and Microspheres	2			2											
			CO2	Understand the various approaches for development of Mucosal drug delivery systems, implantable, buccal drug delivery sytem	2			2											
			CO3	Understand the approaches and Evaluation of Transdermal, Gastro retentive and Naso pulmonary drug delivery system.	2			2											
			CO4	Apply the concept and approaches ocular and targeting methods such as liposomes, niosomes, and nanoparticles	2			2											

67	22PY4137PS	PRACTICE SCHOOL	CO1	Educational initiatives seeking to introduce industry perspective in education	3													
			CO2	To acquire learning by applying the knowledge and the skills they possess		2	3											
			CO3	Simulation of the Industry environment into the process of education				3										
			CO4	Industrial training through experimental and cooperative learning				3										
			CO5	Promotes Partnership and intellectual exchange between academia and industry						3								
68	23UC0010	UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS	CO1	Realize the basic aspiration and understanding harmony in the human being												3		
			CO2	Realize the purpose of family and understand about relationship												3		
			CO3	Realize ways to attain harmony in nature												3		
			CO4	Realize the definitiveness of human conduct												3		
69	22PY4133S	OPERATION OF ANALYTICAL INSTRUMENTS	CO1	Operation of analytical instruments used in life sciences sector		3											3	
			CO2	Operation of analytical instruments used in life sciences sector and in pharmacy industry		3											3	
70	22PY4238T	BIOSTATISITCS AND RESEARCH METHODOLOGY (THEORY)	CO1	Graphical representation of a given numerical data through its frequency distribution and also calculation of various measures of location and dispersion			2											
			CO2	Determines the chances of occurrences of an event through various probability distributions and fit a curve by using principle of least squares			2											
			CO3	Apply ANOVA technique to construct Completely randomized design, randomized block design, Latin square design			2											
			CO4	Apply statistical tests for large and small samples to test the hypothesis. and Analyze the variance by using completely			2											

				randomized, randomized, Latin square designs and also apply queuing models to the real-world problems.														
71	**22PY4239T**	**SOCIAL AND PREVENTIVE PHARMACY (THEORY)**	CO1	Understand current issues related to health and Pharmaceutical problems within the country and worldwide.								2	2	2				
			CO2	Applying current healthcare development for critical way of thinking.								2	2	2				
			CO3	Understanding alternative ways of solving problems related to health issues through various healthcare programs								2	2	2				
			CO4	Understanding alternative ways of solving problems related to sanitation and hygiene.								2	2	2				
72	**22PY4240ET**	**PHARMA MARKETING MANAGEMENT (THEORY)**	CO1	To provide an understanding of sales and marketing of pharmaceutical products	2			2										
			CO2	Know about various policies for drug inventory management	2			2										
			CO3	Know about retail and wholesale marketing	2			2										
			CO4	Understand business potential and development in product sales and manufacturing	2			2										
73	**22PY4241ET**	**PHARMACEUTICAL REGULATORY SCIENCE (THEORY)**	CO1	Know about legal aspects and quality policies for drug manufacturing	2			2										
			CO2	Know about the process of drug discovery and development	2			2										
			CO3	Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals	2			2										
			CO4	Know the regulatory approval process and their registration in Indian and international markets	2			2										
	22PY4242ET	**PHARMACOVIGILANCE (THEORY)**	CO1	Know about the history, basic terminologies & development of Pharmacovigilance & highlight the importance of monitoring in drug safety	2													
			CO2	Applications of the principles of Medra coding & establishing Pharmacovigilance programme in India &			2											

74				providing criteria for														
			CO3	Analyse identified problems and communicate effectively with the regulatory bodies& other stake holders pertaining to the vaccine Pharmacovigilance.				2										
			CO4	Application of ICH Guidelines and clear instructions to follow the practice of Pharmacovigilance in GMP environment.							2							
75	**22PY4243ET**	**QUALITY CONTROL AND STANDARDIZATION OF HERBALS (THEORY)**	CO1	Know WHO guidelines for quality control of herbal drugs	2			2										
			CO2	Know Quality assurance in herbal drug industry	2			2										
			CO3	Know the regulatory approval process and their registration inIndian and international markets	2			2										
			CO4	Appreciate EU and ICH guidelines for quality control of herbal drugs	2			2										
76	**22PY4244ET**	**COMPUTER AIDED DRUG DESIGN (THEORY)**	CO1	Design and discovery of lead molecules	2			3										
			CO2	Application of of drug design in drug discovery process	3			3										
			CO3	Application of the concept of QSAR and docking	3			3										
			CO4	Understand various strategies to develop new drug like molecules	3			3										
77	**22PY4245ET**	**CELL AND MOLECULAR BIOLOGY (THEORY)**	CO1	Summarize cell and molecular biology history	2			2										
			CO2	Summarize cellular functioning and composition	2			2										
			CO3	Describe the chemical foundations of cell biology	2			2										
			CO4	Summarize the DNA properties of cell biology	2			2										
78	**22PY4246ET**	**COSMETIC SCIENCE (THEORY)**	CO1	Principles of formulation and building blocks of skin care products	2			2										
			CO2	Principles of formulation and building blocks of Hair care products	2			2										
			CO3	Role of herbs in cosmetics	2			2										
			CO4	Principles of Cosmetic Evaluation	2			2										
79	**22PY4247ET**	**EXPERIMENTAL PHARMACOLOGY (THEORY)**	CO1	Appreciate the applications of various commonly used laboratory animals	2													
			CO2	Appreciate and demonstrate the various screening methods used in preclinical research		2		2	2									
			CO3	Appreciate and demonstrate the importance of	2	2												

				biostatistics and research methodology															
			CO4	Design and execute a research hypothesis independently		2			2										
80	**22PY4248 ET**	**ADVANCED INSTRUMENTATION TECHNIQUES (THEORY)**	CO1	Understand the advanced instruments used and its applications in drug analysis	2		2												
			CO2	understand the chromatographic separation and analysis of drugs.		2			3										
			CO3	Understand the calibration of various analytical instruments		2			3										
			CO4	Application of analysis of drugs using various analytical instruments		2			3										
81	**22PY4249ET**	**DIETARY SUPPLEMENTS AND NUTRACEUTICALS (THEORY)**	CO1	Understand the need of supplements by the different group of people to maintain healthy life..	2			2											
			CO2	Understand the outcome of deficiencies in dietary supplements	2			2											
			CO3	Appreciate the components in dietary supplements and the application	2			2											
			CO4	Appreciate the regulatory and commercial aspects of dietary supplements including health claims.	2			2											
82	**22PY4250PW**	**PROJECT WORK**	CO1	Application of Pharmacy in clinical settings							2								
			CO2	Application of modern tools usage			3												
			CO3	Application of pharmacy knowledge in communication skills and ethics						3		3							
			CO4	Application of Pharmacy knowledge in research development				3											

CHAPTER 13

SYLLABUS

COMMUNICATION SKILLS THEORY (CS-T)

COURSE CODE	22PY1105T	MODE	R	LTPS	2-0-0-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Apply the practical knowledge using action verbs.	2	1, 4
CO2	Analyze the pronunciations.	4	1, 4
CO3	Applying the concept of probability.	2	1, 4
CO4	Analyze the given conditions and finding out all the possible arrangements in linear & circular order.	2	1, 4

Syllabus

Module 1	**Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context. **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.
Module 2	**Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment. **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication. **Communication Styles:** Introduction, The Communication Styles Matrix with example for each Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.
Module 3	**Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations. **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
Module 4	**Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview.**Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery. **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Basic communication skills for Technology	Andreja. J. Ruther Ford	Pearson Education	2011
2	Communication skills	Sanjay Kumar, Pushpalata	Oxford Press	2011
3	Organizational Behaviour	Stephen.P. Robbins	Pearson Education	2013

COMMUNICATION SKILLS PRACTICAL (CS-P)

COURSE CODE	22PY1105P	MODE	R	LTPS	0-0-2-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Apply the practical of basic communication and analyze the pronunciations	4	1, 4
CO2	Applying the concept of probability and Analyzing the given conditions and finding out all the possible arrangements in linear & circular order.	4	1, 4

Syllabus

Module 1	**Basic communication covering the following topics:** Meeting People, Asking Questions, Making Friends, What did you do? Do's and Don'ts. **Pronunciations covering the following topics:** Pronunciation (Consonant Sounds), Pronunciation and Nouns, Pronunciation (Vowel Sounds).
Module 2	**Advanced Learning:** Listening Comprehension / Direct and Indirect Speech, Figures of Speech, Effective Communication, Writing Skills, Effective Writing, Interview Handling Skills, E-Mail etiquette, Presentation Skills.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Basic communication skills for Technology	Andreja. J. Ruther Ford	Pearson Education	2011
2	Communication skills	Sanjay Kumar, Pushpalata	Oxford Press	2011
3	Organizational Behaviour	Stephen.P. Robbins	Pearson Education	2013

INTEGRATED PROFESSIONAL ENGLISH (IPE)

COURSE CODE	23UC1101	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding the language Mechanics in Basic Grammar & Interactive Listening & Speaking	2	9, 10
CO2	Applying Integrated Reading skills & Techniques of Writing	3	9, 10

Syllabus

Module 1	A. Discuss people you admire (review of tenses, Character adjectives) Discuss a challenge questions) B. Discuss a challenge (Questions, Trying and succeeding)C. Explain what to do and check understanding (Rapid Speech)D. Give advice on avoiding danger (Future time clauses and conditionals) Breaking off a conversation, Explaining and checking understanding .E. Discuss dangerous situations (Narrative tenses, Expressions with 'get')F. Give and respond to compliments (Intonation in Question Tags, Agreeing using question tags; giving compliments and responding)
Module 2	Discuss ability and achievement (Multi-word verbs, Ability and achievement) Discuss sports activities and issues (present perfect and present perfect continuous, words connected with sports). C. Make careful suggestions (Keeping to the topic of the conversation; Making careful suggestions) D. Discuss events that changed your life (used to and would, cause and result)
Module 3	A. Discuss choices, discuss changes (infinitives and ing forms, the passive) B. Introduce requests and say you are grateful (Consonant sounds) C. Discuss living in cities (too / enough; so / such, Describing life in cities) D. Discuss changes to a home (Causative have / get Film and TV; Houses) E. Imagine how things could be (Stress in compound nouns) F. Discuss personal finance (First and second conditionals)
Module 4	A. Discuss moral dilemmas and crime (Third conditional; should have + past participle), Stressed and unstressed words; Sound and spelling B. Discuss new inventions (Relative clauses), Discuss people's lives and achievements Reported speech; Reporting verbs, verbs describing thought and knowledge. C. Express uncertainty (Linking and intrusion, Clarifying a misunderstanding) D. Speculate about the past (Past modals of deduction Adjectives with prefixes) E. Discuss life achievements (Wishes and regrets, Verbs of effort) F. Describe how you felt (Consonant clusters, describing how you felt; Interrupting and announcing news)

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	EMPOWER	Andrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones	Cambridge University Press	2022
2	PRACTICAL ENGLISH USAGE, 4TH EDN: Michael Swan's guide to problems in English (Practical English Usage, 4th edition)	Michael Swan	OXFORD	2022
3	Word Power Made Easy	Norman Lewis	OXFORD	2022

ENGLISH PROFICIENCY (EP)

COURSE CODE	23UC1202	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding Language Mechanics in advanced Grammar and advanced Communicative Listening & Speaking	2	9, 10
CO2	Applying the advanced Reading techniques and Advanced Techniques of Writing	3	9, 10

Syllabus

Module 1	A. Talk about learning a second language (adverbs and adverbial language learning noun forms, word stress and noun forms with – *tion* and *-ity*) B. Describe extreme sensory experiences (Comparison, multi-word verbs, C. Talk about crime and punishment (relative clauses) D. Talk about using instinct and reason (noun phrases); Express yourself in an inexact way. E. Describe photos and hobbies (simple and continuous verbs and adjectives) F. Idioms: body parts, movement, landscapes, crime and feelings
Module 2	A. Talk about plans, intensions, and arrangements (intensions and arrangements, verbs of movement); Give advice (advising a friend about a problem) B. Emphasis positive and negative experiences by describing journeys and landscapes; architecture and buildings (future in the past, narrative tenses, ellipsis, and substitutions) C. Listen to Job Profiles. Talk about job requirements and fair pay (obligation, necessity, and permission) D. Listen to/Tell a descriptive narrative – a personal story (participle clauses) E. Emphasis opinions about the digital age- explain how you would overcome a hypothetical problem. F. Describe sleeping habits, routines, lifestyles and life expectancy (gerunds, infinitives and conditionals)
Module 3	A. Paraphrasing and summarising B. Read and talk about memories and remembering (structures with have and get) C. Speculate about inventions and technology (compound adjectives) D. City life and urban space (reflexive and reciprocal pronouns, verbs with re-) E. Superstitions and rituals (passive reporting verbs) F. Read a review, report, and recommendation of a committee.
Module 4	A. Write a web forum post (expressing opinions) B. Write a report and travel review. C. Write a profile article (read an Interview of a celebrity and write an article) D. Write an essay: opinion essay and discussion essay. E. Write an application e-mail. F. Write promotional material using persuasive language.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Empower 3rd Edition	Andrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones	Cambridge	2022
2	The Cambridge Guide to English Usage	Pam Peters	Cambridge	2020
3	Academic English	Letty Chan	Hong Kong : Hong Kong University Press ; London : Eurospan distributor	2021

DESIGN THINKING AND INNOVATION (DTI)

COURSE CODE	23UC1203	MODE	R	LTPS	2-0-2-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the importance of Design thinking mindset for identifying contextualized problems	2	2, 6
CO2	Analyze the problem statement by empathizing with user	4	3, 7
CO3	Develop ideation and test the prototypes made	3	5, 7
CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity	2	5, 8

Syllabus

Module 1	Introduction to Design Thinking and Innovation • Introduction to design thinking and its principles • Learning, listening, observation, dialogue, and reading in the context of design thinking • 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)
Module 2	Design Thinking Process • Overview of the design thinking process • Design thinking for contextualized problem-solving • Incorporating sustainable development goals into design thinking • 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
Module 3	Ideation and Prototyping • 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
Module 4	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:

Sl No	Title	Author(s)	Publisher	Year
1	Design Thinking in Classroom	David Lee	Ulysses Press	2018
2	The Art of Innovation Lessons in Creativity from IDEO	Tom Kelley	IDEO	2001
3	The Design Thinking *Play Book*	Michael Lewrick, Patrick Link & Larry Leifer	Wiley Press	2018
4	Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation	Tim Brown	Harper Business	2009
5	Unmukt-Science and Art of Design Thinking	Arun Jain	Arun Jain and School of Design Thinking	2019

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS (UHV&PE)

COURSE CODE	23UC0010	MODE	R	LTPS	2-0-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand and analyse the essentials of human values and skills, self-exploration, happiness and prosperity.	2	1
CO2	Evaluate coexistence of the "I" with the body.	3	4
CO3	Identify and associate the holistic perception of harmony at all levels of existence.	4	5
CO4	Develop appropriate technologies and management patterns to create harmony in professional and personal lives.	4	10

Syllabus

Module 1	Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, 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.
Module 2	Harmony in the Human Being: Understanding the Human Being as Co-existence 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, Program to Ensure Sanyam and Svasthya.
Module 3	Harmony in the Family and Society: Harmony in the Family - the Basic Unit of Human Interaction, Values in Human-to-Human Relationships, 'Trust' – the Foundational Value in Relationships, 'Respect' – as the Right Evaluation, Understand Harmony in the Society, Vision for the Universal Human Order.
Module 4	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 Co-existence' at All Levels, The Holistic Perception of Harmony in Existence.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	A foundation course in human values & professional ethics	R.R. Gaur, R. Sangal, G.P. Bagaria	Excel Books, New Delhi	1996
2	Universal human values and professional ethics	Dr. ARCHANA CHAUDHARY	Book Rivers	2001
3	Universal human values and professional ethics	Dr. Ritu Soryan	katson print	2001
4	Human values and professional ethics	B.S.Raghavan	S. Chand	2004

REMEDIAL BIOLOGY (RBT)

COURSE CODE	22PY1106RBT	MODE	R	LTPS	2-0-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Introduce biology to non-biology students	2	1
CO2	Know the classification and salient features of five kingdoms of life	1	1
CO3	Understand the basic components of anatomy & physiology of plant	2	1
CO4	Understand the basic components of anatomy & physiology animal with special reference to human	2	1

Syllabus

Module 1	**Living world:** Definition and characters of living organisms, Diversity in the living world, Binomial nomenclature.
Module 2	Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus. **Morphology of Flowering plants:** Morphology of different partsof flowering plants – Root, stem,inflorescence, flower, leaf, fruit, seed. General Anatomy of Root, stem,leaf of monocotyledons & Dicotylidones.
Module 3	**Plants and mineral nutrition:** Essential mineral, macro and micronutrients, Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation. **Photosynthesis:** Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis. **Plant respiration:** Respiration, glycolysis,fermentation (anaerobic). **Plant growth and development:** Phases and rate of plant growth, Conditionof growth, Introduction to plant growth regulators. **Cell - The unit of life:** Structure and functions of cell and cell organelles. Cell division. **Tissues:** Definition, types of tissues, location and functions
Module 4	**Body fluids and circulation:** Composition of blood, blood groups, coagulation of blood. Compositionand functions of lymph. Human circulatory system. Structure of human heart and blood vessels. Cardiaccycle, cardiac output and ECG. **Digestion and Absorption:** Human alimentary canal and digestive glands. Role of digestive enzymes. Digestion, absorption and assimilation of digested food. **Breathingand respiration:** Human respiratory system. Mechanism of breathing and its regulation. Exchange of gases, transport of gases and regulation of respiration. Respiratory volumes **Excretory products and their elimination:** Modes of excretion, Human excretory system-structure and function, Urine formation, Rennin angiotensin system. **Neural control and coordination:** Definition and classification of nervous system, Structure of a neuron, Generation and conduction of nerve impulse, Structure of brain and spinal cord, Functions of cerebrum, cerebellum, hypothalamus and medullaoblongata. **Chemical coordination and regulation:** Endocrine glands and their secretions, Functions of hormones secreted by endocrine glands. **Human reproduction:** Parts of female reproductive system, Parts of male reproductive system, Spermatogenesis and Oogenesis, Menstrual cycle

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	A Text book of Biology	S. B. Gokhale	Nirali Prakashan	2019
2	A Text book of Biology	Dr. Thulajappa and Dr. Seetaram	Cengage Learning India Private Limited; 2nd edition	June 1, 2015
3	A Text book of Biology	Naidu and Murthy	Bangalore Prakasha Sahithya 1988	1988

REMEDIAL MATHEMATICS (RM)

COURSE CODE	22PY1106RMT	MODE	R	LTPS	2-0-0-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Introduce essential of mathematics to biology students.	2	2,3
CO2	Know the theory and their application in Pharmacy	2	2,3
CO3	Solve the different types of problems by applying theory	2	2,3
CO4	Appreciate the important application of mathematics in Pharmacy	2	2,3

Syllabus

Module 1	Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method
Module 2	Partial fraction: Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics Logarithms
Module 3	Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions and Conditions for a function to be a maximum or a minimum at a point
Module 4	Application Analytical Geometry Introduction: Signs of the Coordinates, Distance formula, Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicular of two lines, Slope of a line joining two points, Slope intercept form of a straight

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Differential Calculus	Shanthinarayan	Schand	2018
2	Pharmaceutical Mathematics with application to Pharmacy	Panchaksharappa Gowda D.H	H media press	2015
3	Integral Calculus	Shanthinarayan	Schand	2018
4	Higher Engineering Mathematics	Khann Publisher	Dr.B.S.Grewal	2012
5	Higher Engineering Mathematics	Tata Maghill	Dr.B.V.Ramana	2015

REMEDIAL BIOLOGY PRACTICAL (RBP)

COURSE CODE	22PY1106RBP	MODE	R	LTPS	0-0-2-0	PRE-REQUISITE	Nil

Course Outcomes

CO No	Course Outcomes	PO/PSO	BTL
1	Demonstration of experiments in biology and application of In silico models to demonstrate experiments on frog	2,4	3
2	Identification of tissues and Determination of BP, Blood group and TV	4	3

Syllabus

Module 1	1. Introduction to experiments in biology: Study of Microscope, Section cutting techniques, Mounting and staining, Permanent slide preparation 2. Study of cell and its inclusions 3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications 4. Detailed study of frog by using computer models
Module 2	1. Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower 2. Identification of bones 3. Determination of blood group 4. Determination of blood pressure 5. Determination of tidal volume

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	A Text book of Biology	S. B. Gokhale	Nirali Prakashan	2019
2	A Text book of Biology	Dr. Thulajappa and Dr. Seetaram	Cengage Learning India Private Limited; 2nd edition	June 1, 2015
3	A Text book of Biology	Naidu and Murthy	Bangalore Prakasha Sahithya 1988	1988

COMPUTER APPLICATIONS IN PHARMACY THEORY (CAP-T)

COURSE CODE	22PY1211T	MODE	R	LTPS	3-0-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To understand the knowledge of Numbering system and its calculations Understand the concepts of Information System and software	2	4
CO2	To know the knowledge using HTML, XML, CSS, MS access languages. Understand the concepts of web technologies.	2	5
CO3	To understand the various types of application of computers in pharmacy	2	5
CO4	To know knowledge on Data analysis in preclinical development Understand the concept of Bioinformatics.	2	5

Syllabus

Module 1	**Number system**: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division. **Concept of Information Systems and Software: I**nformation gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project **Web technologies**: Introduction to HTML, XML, CSS and Programming languages,introduction to web servers and Server Products. Introduction to databases, MYSQL, MSACCESS, Pharmacy Drug database.
Module 2	**Application of computers in Pharmacy –** Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring. Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System
Module 3	**Bioinformatics:** Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.
Module 4	**Computers as data analysis in Pre-clinical development:** Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Computer Application in Pharmacy	William E.Fassett	Lea and Febiger	1986
2	Computer Application in Pharmaceutical Research and Development	Sean Ekins Wiley, A John Willey	INC., Publication,	Vol 2 1975
3	Bioinformatics (Concept, Skills and Applications)	S.C.Rastogi	CBS Publishers	2003

COMPUTER APPLICATIONS IN PHARMACY PRACTICAL (CAP-P)

COURSE CODE	22PY1211P	MODE	Regular	LTPS	0-0-2-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Apply knowledge on creating a HTML web page to show personal information. Understand to Design a questionnaire using a word processing package to gather information about a particular disease. Know to retrieve the information of a drug and its adverse effects using online tools; Apply knowledge on creating mailing labels Using Label Wizard, generating label in MSWORD, create a database in MS Access to store the patient information with the required fields Using access, design a form in MS Access to view, add, delete and modify the patient recording the database	2	3
CO2	Apply knowledge for Drug information storage and retrieval using MS Access. Understand to generating report and printing the report from the patient database 8 Creating invoice table using – MS Access; Apply knowledge Creating and working with queries in MS Access, Exporting Tables, Queries, Forms and Reports to web page, Exporting Tables, Queries, Forms and Reports to XML pages	2	3

Syllabus

Module 1	Design a questionnaire using a word processing package to gather information about a particular disease. Create a HTML web page to show personal information. Retrieve the information of a drug and its adverse effects using online tools. Creating mailing labels Using Label Wizard, generating label in MSWORD. Create a database in MS Access to store the patient information with the required fields Using access. Design a form in MS Access to view, add, delete and modify the patient recording the database
Module 2	Generating report and printing the report from patient database 8 Creating invoice table using – MS Access; Drug information storage and retrieval using MS Access; Creating and working with queries in MS Access; Exporting Tables, Queries, Forms and Reports to web page; Exporting Tables, Queries, Forms and Reports to XML pages

Reference Books:

S. No	Title	Author(s)	Publisher	Year
1	Computer Application in Pharmacy	William E. Fassett	Lea and Febiger	1986
2	Computer Application in Pharmaceutical Research and Development	Sean Ekins Wiley,A John Willey	INC., Publication,	Vol 2 1975
3	Bioinformatics (Concept, Skills and Applications)	S. C. Rastogi	CBS Publishers	2003

ENVIRONMENTAL SCIENCE (ES)

COURSE CODE	22PY1212T	MODE	R	LTPS	3-0-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the importance of Environmental education and conservation of natural resources.	2	6
CO2	Understand the importance of renewable natural resources.	2	6
CO3	Understand the importance of ecosystems and biodiversity	2	6
CO4	Understand the environmental science knowledge on solid waste management, disaster management and EIA process	2	6

Syllabus

Module 1	The Multidisciplinary nature of environmental studies Natural Resources, Renewable and non-renewable resources Introduction.
Module 2	Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.
Module 3	Ecosystems Concept of an ecosystem. Structure and function of an ecosystem. Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem, Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Module 4	Environmental Pollution: Air pollution; Water pollution; Soil pollution

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Environmental Science	Anubha Kaushik	New age international limited	,2017 2020
2	Environmental Studies	Benny Joseph	Tata McGraw-Hill companies	2009

HUMAN ANATOMY AND PHYSIOLOGY I THEORY (HAP I-T)

COURSE CODE	22PY1101T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Describe the cellular level and tissue level organisation of an organ in human body	2	1,9
CO2	Describe the anatomical features and physiology of skin, bone and skeletal muscle and joints and their related disorders	2	1,9
CO3	Summarize the anatomical and physiological functions of blood and heart and their related disorders	2	1,9
CO4	Describe the physiological aspects and pathological peripheral nervous system	2	1,9

Syllabus

Module 1	Definition and scope of anatomy and physiology, Levels of structural organization and body systems, Basic life processes, Homeostasis, Basic anatomical terminology, Structure and functions of cell, Transport across cell membrane, Cell division, Cell junctions, General principles of cell communication, intracellular signalling pathway activation by extracellular signal molecule, Forms of intracellular signalling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine, Classification of tissues, Structure, location and functions of epithelial, muscular and nervous and connective tissues
Module 2	Introduction to skin, Skin structure, Disease related to skin, Divisions of skeletal system, Types of bone, salient features and functions of bones, Axial and appendicular skeletal system, Organization of skeletal muscle, Physiology of muscle contraction, Neuromuscular junction, Structural and functional classification of joint, Types of joints movements and its articulation.
Module 3	Body fluids, composition and functions of blood, Hemopoiesis, formation of haemoglobin, anaemia, Mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance, Disorders of blood, Reticulo-endothelial system, Heart – anatomy of heart, Blood circulation, blood vessels, structure and functions of artery, vein and capillaries, Elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, Cardiac output, cardiac cycle, Regulation of blood pressure, Pulse, Electrocardiogram, Disorders of heart, Lymphatic organs and tissues, Lymphatic vessels, Lymph circulation, Functions of lymphatic system.
Module 4	Introduction about peripheral nervous system, spinal nerves, cranial nerves Structure and functions of eye, ear, nose, tongue and skin and their disorders.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Textbook of Medical Physiology	Arthur C, Guyton and John E. Hall.	Miamisburg, OH, U.S.A.	2020
2	Human Physiology (vol 1 and 2) by	Dr. C.C. Chatterrje,	Academic Publishers Kolkata	2018
3	Anatomy and Physiology in Health and Illness	Kathleen J.W. Wilson,	Churchill Livingstone, New York	2017
4	Anatomy and Physiology	Ross and Wilson	Oswaal Books And Learning Private Limited; 14th edition	2022
5	Principles of Anatomy and Physiology	Tortora Grabowski	Palmetto, GA, U.S.A. 32	2021

HUMAN ANATOMY AND PHYSIOLOGY I PRACTICAL (HAP I-P)

COURSE CODE	22PY1101P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To identify the gross anatomy and functions of microscope, connective tissues, skeletal system, and understanding and performance of bleeding and clotting time.	2	1, 5
CO2	To understand and performs the blood group analysis, ESR rate, heart rate, pulse, BP, and measurement of haemoglobin, RBC, and WBC counts.	2	1, 5

Syllabus

Module 1	1. Study of compound microscope 2. Microscopic study of epithelial and connective tissue 3. Microscopic study of muscular and nervous tissue 4. Identification of axial bones 5. Identification of appendicular bones 6. Introduction to hemocytometry 7. Determination of bleeding time and clotting time.
Module 2	8. Determination of blood group 9. Determination of erythrocyte sedimentation rate (ESR) 10. Determination of heart rate and pulse rate and recording of blood pressure 11. Estimation of haemoglobin content 12. Introduction to haemocytometer 13. Enumeration of white blood cell (WBC) count 14. Enumeration of total red blood corpuscles (RBC) count

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Practical Manual of Human Anatomy & Physiology	Iswar Hazarika and Anju Das	Jaypee Brothers Medical Publishers	2016
2	Human Physiology (vol 1 and 2) by	Dr. C.C. Chatterrje,	Academic Publishers Kolkata	2018
3	Anatomy and Physiology in Health and Illness	Kathleen J.W. Wilson,	Churchill Livingstone, New York	2017
4	Human Physiology	John E. Hall	Elsevier	2023
5	Principles of Anatomy and Physiology	Tortora Grabowski	Palmetto, GA, U.S.A. 32	2021

PHARMACEUTICAL ANALYSIS THEORY (PA-T)

COURSE CODE	22PY1102T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Outline Preparation and standardization of different molar and normal solutions. Enlist Sources, types and methods of Minimizing errors.	2	PO1
CO2	Explains Theories and Classifications of Volumetric titrations.	2	PO1
CO3	Importance of Complexometry, Masking and Demasking agents. Concepts of Redox-titrations.	2	PO1
CO4	Illustrate Construction and working of Reference and indicator electrodes	2	PO2

Syllabus

Module 1	**Pharmaceutical analysis**- Definition and scope of Different techniques of analysis; Methods of expressing concentration. Primary and secondary standards. Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate. **Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures.
Module 2	**Acid base titration:** Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves. **Non-aqueous titration:** Solvents, Acidimetry and Alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl. **Precipitation titrations:** Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride. **Gravimetry:** Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
Module 3	**Complexometric titration:** Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate. **Diazotization titration:** Basic Principles, methods and application of diazotization titration. **Redox titrations:** Concepts of oxidation and reduction; Types of redox titrations (Principles and applications); Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate
Module 4	Electrochemical methods of analysis: Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications. Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications. Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Practical Pharmaceutical Chemistry Vol I & II	A.H. Beckett & J.B. Stenlake's	Stahlone Press of University of London	1988
2	Text Book of Quantitative Inorganic analysis	A.I. Vogel	Longman Group UK Limited	1989
3	Inorganic Pharmaceutical Chemistry	P. Gundu Rao	Delhi Vallabh Prakashan	2008
4	Textbook of Pharmaceutical Chemistry	Bentley and Driver's	Oxford / BSP Books	2020
5	Analytical chemistry principles	John H. Kennedy	Saunders College Pub	1990

PHARMACEUTICAL ANALYSIS PRACTICAL (PA-P)

COURSE CODE	22PY1102P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Determining the exact amount and concentration of chemical substances	3	1
CO2	Determining the exact amount, concentration and normality of chemical substances	3	1

Syllabus

Module 1	Preparation and Standardization of Sodium hydroxide, Sulphuric acid, Sodium thiosulphate, Potassium permanganate, Ceric ammonium sulphate. Assay of following compounds along with standardization of titrant: Ammonium chloride by Acid Base titration, Sodium benzoate by Non-Aqueous titration, Sodium chloride by precipitation titration.
Module 2	Assay of following compounds along with standardization of titrant: Ferrous sulphate by Cerimetry, Copper sulphate by Iodometry, Calcium Gluconate by Complexometry. Determination of Normality by Electro-analytical methods : Conductometric titration of strong acid against strong base; Conductometric titration of strong acid and weak acid against strong base; Potentiometric titration of strong acid against strong base.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Practical Pharmaceutical Chemistry Vol I & II	A.H. Beckett & J.B. Stenlake's	Stahlone Press of University of London	1988
2	Text Book of Quantitative Inorganic analysis	A.I. Vogel	Longman Group UK Limited	1989
3	Inorganic Pharmaceutical Chemistry	P. Gundu Rao	Delhi Vallabh Prakashan	2008
4	Textbook of Pharmaceutical Chemistry	Bentley and Driver's	Oxford / BSP Books	2020
5	Analytical chemistry principles	John H. Kennedy	Saunders College Pub	1990

PHARMACEUTICS THEORY (PC-T)

COURSE CODE	22PY1103T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Know the history of profession of pharmacy, Understand the basics of different dosage forms, Understand the professional way of handling the prescription	2	1
CO2	Understand the basics of pharmaceutical calculations, Understand the different powder dosage forms	2	1
CO3	Understand the liquid dosage forms	2	1
CO4	Understand the different semi-solid dosage forms	2	1

Syllabus

Module 1	**Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, **Pharmacopoeias:** Introduction to IP, BP, USP and Extra Pharmacopoeia. Dosage forms: Introduction to dosage forms, classification and definitions. **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription. **Posology:** Definition, Factors affecting posology. Paediatric dose calculations based on age, body weight and body surface area.
Module 2	**Pharmaceutical calculations:** Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight. **Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions. Snuff, Insufflations, Divided & bulk powders, Dentifrices, Douches. **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques
Module 3	**Monophasic liquids**: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions. Solutions, Linctuses. **Biphasic liquids: Suspensions**: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome. **Emulsions**: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.
Module 4	**Suppositories:** Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories. **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi-solid dosage forms. Evaluation of semi-solid dosages forms.Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical Dosage Form and Drug Delivery System	Loyd Allen	Wolters Kluwer Health, Baltimore	2021
2	Dispensing for Pharmaceutical Students	John William Cooper	Pitman Medical Publishing Company	2008
3	The Science & Dosage Form Design	M.E. Aulton	Churchill Livingston	1998
4	Theory and Practice of Industrial Pharmacy	Lachmann	Lea & Febiger Publisher	2020
5	The Science and Practice of Pharmacy	Alfonso R. Gennaro	John Wiley & Sons Australia, Limited	2003

PHARMACEUTICS PRACTICAL (PC-P)

COURSE CODE	22PY1103P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Classifying various solid and liquid dosage forms, preparation and dispensing of ORS powder, effervescent granules, dusting powders, powders, Syrups, Elixirs, Linctus, Solutions, Gargles and Mouthwashes	2	2
CO2	Classification of Biphasic liquid dosage forms and semi solid dosage forms, preparing and dispensing of Suspensions, Emulsions, suppositories, ointments and gels	2	2

Syllabus

Module 1	To Prepare & dispense ORS powder (WHO), To Prepare & dispense Effervescent granules To Prepare & dispense Dusting powders, To Prepare & dispense Divided powders To Prepare & dispense simple syrup IP To Prepare & dispense compound Syrup BPC To Prepare & dispense Piperazine citrate elixir To Prepare & dispense Paracetamol paediatric elixir To Prepare & dispense Terpin Hydrate Linctus To Prepare & dispense Mandles Paint To Prepare & dispense Iodine gargle, To Prepare & dispense chlorhexidine mouthwash
Module 2	To Prepare & dispense Strong solution of ammonium acetate To Prepare & dispense Cresol with soap solution To Prepare & dispense Lugol's Solutions To Prepare & dispense Calamine lotion To Prepare & dispense Magnesium Hydroxide mixture To Prepare & dispense Aluminium Hydroxide gel To Prepare & dispense Turpentine Liniment; To Prepare & dispense Liquid paraffin emulsion To Prepare & dispense Glycero gelatin suppository To Prepare & dispense Coca butter suppository To Prepare & dispense Zinc oxide suppository To Prepare & dispense carbopol gel To Prepare & dispense Sulphur ointment, To Prepare & dispense Non staining-iodine ointment

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical Dosage Form and Drug Delivery System	Loyd Allen	Wolters Kluwer Health, Baltimore	2021
2	Dispensing for Pharmaceutical Students	John William Cooper	Pitman Medical Publishing Company	2008
3	The Science & Dosage Form Design	M.E. Aulton	Churchill Livingston	1998
4	Theory and Practice of Industrial Pharmacy	Lachmann	Lea & Febiger Publisher	2020
5	The Science and Practice of Pharmacy	Alfonso R. Gennaro	John Wiley & Sons Australia, Limited	2003

PHARMACEUTICAL INORGANIC CHEMISTRY THEORY (PIC-T)

COURSE CODE	22PY1104T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	Course Outcomes	BTL	PO Mapping
CO1	Classify various inorganic compounds, sources of Impurities and test for purity of Impurities	1	1
CO2	Understand the monograph study of various inorganic compounds belongs to Acid base regulators, Intra & Extracellular Electrolytes	2	1
CO3	Understand the monograph study of various inorganic compounds belongs to Dental products & Gastro-intestinal agents	2	1
CO4	Understand the monograph study of various inorganic compounds belongs to Miscellaneous agents & Radiopharmaceuticals	2	1

Syllabus

	Topics
Module 1	**Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate. **General methods of preparation**, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes
Module 2	**Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity. **Major extra and intracellular electrolytes**: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.
Module 3	**Dental products**: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.**Gastrointestinal agents: Acidifiers:** Ammonium chloride* and Dil. HCl. **Antacid:** Ideal properties of antacids, combinations of antacids, Sodium. Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture. **Cathartics:** Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite. **Antimicrobials**: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations.
Module 4	**Miscellaneous compounds: Expectorants:** Potassium iodide, Ammonium chloride*. **Emetics**: Copper sulphate*, Sodium potassium tartarate **Haematinics:** Ferrous sulphate*, Ferrous gluconate. **Poison and Antidote:** Sodium thiosulphate*, Activated charcoal, Sodium nitrite333. **Astringents**: Zinc Sulphate, Potash Alum. **Radiopharmaceuticals**: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half-life, radio isotopes and study of radio isotopes - Sodium iodide I^{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text Book of Quantitative Inorganic analysis	A.I. Vogel,	Pearson Education	2014
2	Inorganic Pharmaceutical Chemistry, 3rd Edition	P. Gundu Rao	Pearson Education	2013
3	Inorganic Pharmaceutical Chemistry	M.L. Schroff,	National book centre	2012

PHARMACEUTICAL INORGANIC CHEMISTRY-I PRACTICAL (PIC-P)

COURSE CODE	22PY1104P	MODE	R	LTPS	0-4-0-0	PRE-REQUISITE	NA

Course Outcomes

CO#	Course Outcomes	BTL	PO Mapping
CO1	Test for "Limit tests "for the ions and Identification tests	4	1
CO2	Determination of purity of various inorganic compounds and preparation of inorganic pharmaceuticals	3	1

Syllabus

	Topics
Module 1	Limit tests for following ions: Limit test for Chlorides and Sulphates. Modified limit test for Chlorides and Sulphates. Limit test for Iron. Limit test for Heavy metals. Limit test for Lead. Limit test for Arsenic. Identification test: Magnesium hydroxide, Ferrous sulphate, Sodium bicarbonate, Calcium gluconate, Copper sulphate
Module 2	Test for purity: Swelling power of Bentonite, Neutralizing capacity of aluminum hydroxide gel, Determination of potassium iodate and iodine in potassium Iodide Preparation of inorganic pharmaceuticals: Boric acid, Potash alum & Ferrous, Sulphate

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Essentials of Organic Chemistry:	Morrison and Boyd	Pearson Education	2010
2	Organic Chemistry	by I.L. Finar , Volume-I	Pearson Education	2000
3	Textbook of Organic Chemistry	B.S. Bahl & Arun Bahl.	S chand	2010

HUMAN ANATOMY AND PHYSIOLOGY II THEORY (HAP II-T)

COURSE CODE	22PY1207T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	HAP-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the gross morphology, structure and functions of Central Nervous system and Brain.	2	1, 5
CO2	Understand the gross morphology, structure and functions of digestive system. Formation and role of ATP, Creatinine Phosphate and BMR	2	1, 5
CO3	Understand the gross morphology, structure and functions of respiratory and urinary system.	2	1, 5
CO4	Understand the gross morphology, structure and functions of endocrine and reproductive system. Introduction to genetics.	2	1, 5

Syllabus

Module 1	Nervous system: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid.structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts,reflex activity).
Module 2	**Digestive system:** Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT. **Energetics:** Formation and role of ATP, Creatinine Phosphate and BMR.
Module 3	**Respiratory system:** Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration, Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods. **Urinary system:** Anatomy of urinarytract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RASin kidney and disorders of kidney.
Module 4	**Endocrine system:** Classification of hormones, mechanism of hormone action, structure and functionsof pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders. **Reproductive system:** Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition. **Introduction to genetics:** Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Textbook of Medical Physiology	Arthur C, Guyton and John E. Hall.	Miamisburg, OH, U.S.A.	2020
2	Human Physiology (vol 1 and 2) by	Dr. C.C. Chatterrje,	Academic Publishers Kolkata	2018
3	Anatomy and Physiology in Health and Illness	Kathleen J.W. Wilson,	Churchill Livingstone, New York	2017
4	Anatomy and Physiology	Ross and Wilson	Oswaal Books And Learning Private Limited; 14th edition	2022
5	Principles of Anatomy and Physiology	Tortora Grabowski	Palmetto, GA, U.S.A. 32	2021

HUMAN ANATOMY AND PHYSIOLOGY II PRACTICAL (HAP II-P)

COURSE CODE	22PY1207P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	HAP-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Demonstrate the gross anatomy and functions of nervous, endocrine, integumentary and special senses, functions of the olfactory nerve, neurological, visual and reflesx activity; Applying the skills and knowledge required to perform laboratory experiments safely with appropriate equipment.	4	1,5
CO2	Demonstration on positive and negative feedback mechanism, body temperature, tidal volume and vital capacity, basal mass index, total blood count by cell analyser, basal mass index, total blood count by cell analyser.	4	1,5

Syllabus

Module 1	1. To study the integumentary and special senses using specimen, models, etc., 2. To study the nervous system using specimen, models, etc., 3. To study the endocrine system using specimen, models, etc 4. To demonstrate the general neurological examination 5. To demonstrate the function of olfactory nerve 6. To examine the different types of taste. 7. To demonstrate the visual acuity 8. To demonstrate the reflex activity
Module 2	9. Recording of body temperature 10. To demonstrate positive and negative feedback mechanism. 11. Determination of tidal volume and vital capacity. 12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens. 13. Recording of basal mass index. 14. Study of family planning devices and pregnancy diagnosis test. 15. Demonstration of total blood count by cell analyser 16. Permanent slides of vital organs and gonads

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Practical Manual of Human Anatomy & Physiology	Iswar Hazarika and Anju Das	Jaypee Brothers Medical Publishers	2016
2	Human Physiology (vol 1 and 2) by	Dr. C.C. Chatterrje,	Academic Publishers Kolkata	2018
3	Anatomy and Physiology in Health and Illness	Kathleen J.W. Wilson,	Churchill Livingstone, New York	2017
4	Human Physiology	John E. Hall	Elsevier	2023
5	Principles of Anatomy and Physiology	Tortora Grabowski	Palmetto, GA, U.S.A. 32	2021

PHARMACEUTICAL ORGANIC CHEMISTRY-I THEORY (POC I-T)

COURSE CODE	22PY1208T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO NO	Course Outcomes	BTL	PO Mapping
CO1	Understand the structure, name and the type of isomerism of the organic compound	2	1,4
CO2	Understand the name of the reaction and orientation of reactions	2	1,4
CO3	Understand the reactivity /stability of compound	2	1,4
CO4	Understand the Named reactions in Organic chemistry	2	1,4

Syllabus

	Topics
Module 1	Classification, nomenclature and isomerism: Classification of Organic Compounds. Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds), Structural isomerisms in organic compounds. Alkanes*, Alkenes* and Conjugated dienes
Module 2	SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP^2 hybridization in alkenes, E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbo-cations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes,
Module 3	Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement Alkyl halides*: SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN1 versus SN2 reactions, Factors affecting SN1 and SN2reactions. Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol.
Module 4	Carbonyl compounds* (Aldehydes and ketones): Nucleophilic addition, Electrometric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde. Carboxylic acids*: Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester. Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid. Aliphatic amines* - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	**Essentials of Organic Chemistry:**	Morrison and Boyd	Pearson Education	2010
2	Organic Chemistry	by I.L. Finar , Volume-I	Pearson Education	2000
3	Textbook of Organic Chemistry	B.S. Bahl & Arun Bahl.	S chand	2010

PHARMACEUTICAL ORGANIC CHEMISTRY-I PRACTICAL (POC I-P)

COURSE CODE	22PY1208P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	NA

Course Outcomes

CO#	Course Outcomes	BTL	PO Mapping
CO1	Test for organic compounds, detection of elements and their functional groups	4	4
CO2	Identification of unknown compounds and preparation of derivatives	4	1, 4

Syllabus

	Topics
Module 1	Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test Solubility test Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
Module 2	Melting point/Boiling point of organic compounds Identification of the unknown compound from the literature using melting point/ boiling point. Minimum 5 unknown organic compounds to be analyzed systematically. Preparation of suitable solid derivatives from organic compound construction of molecular models

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	**Essentials of Organic Chemistry:**	Morrison and Boyd	Pearson Education	2010
2	Organic Chemistry	by I.L. Finar , Volume-I	Pearson Education	2000
3	Textbook of Organic Chemistry	B.S. Bahl & Arun Bahl.	S chand	2010

BIOCHEMISTRY THEORY (BC-T)

COURSE CODE	22PY1209T	R	Offline	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the principles of chemistry in biology.	1,2	2
CO2	Understand the catalytic role of enzymes and enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.	1,2	2
CO3	Understand the metabolism of nutrient molecules in physiological and pathological conditions.	1,2	2
CO4	Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.	1,2	2

Syllabus

Module 1	Biomolecules: Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. Bioenergetics: Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP.
Module 2	Carbohydrate metabolism: Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance. HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency. Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance. Hormonal regulation of blood glucose level and Diabetes mellitus. Biological oxidation: Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation. Inhibitors ETC and oxidative phosphorylation/Uncouplers.
Module 3	Lipid metabolism: Oxidation of saturated fatty acid (Palmitic acid). Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid). Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D. Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity. Amino acid metabolism: General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders. Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia). Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline. Catabolism of heme; hyperbilirubinemia and jaundice.
Module 4	Nucleic acid metabolism and genetic information transfer: Biosynthesis of purine and pyrimidine nucleotides. Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis. Genetic code, Translation or Protein synthesis and inhibitors. Enzymes: Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot). Enzyme inhibitors with examples. Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation. Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Principles of Biochemistry	Lehninger	W H Freeman & Co	2017
2	Harper's Biochemistry	Robert K. Murry, Daryl K. Granner and Victor W. Rodwell	Mcgraw-hill	2003
3	Biochemistry	D. Satyanarayan and U.Chakrapani	Elsevier	2010
4	Practical Biochemistry	R.C. Gupta and S. Bhargavan	CBS Publishers	2009
5	Practical Biochemistry	Harold Varley	CBS Publishers	2005

BIOCHEMISTRY PRACTICAL (BC-P)

COURSE CODE	22PY1209P	MODE	Offline	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Qualitative and quantitative analysis of carbohydrates, proteins cholesterol, measurement of pH and blood cholesterol	1,2	PO2
CO3	Preparation of buffer solutions, Enzymatic hydrolysis of biomolecules and salivary enzyme activity.	1,2	PO2

Syllabus

Module 1	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch), Identification tests for Proteins (albumin and Casein), and Quantitative analysis of reducing sugars (DNSA method). Quantitative analysis of Proteins (Biuret method), Qualitative analysis of urine for abnormal constituents and Determination of blood creatinine.
Module 2	Determination of blood sugar, Determination of serum total cholesterol , Preparation of buffer solution and measurement of pH and Study of enzymatic hydrolysis of starch. Determination of Salivary amylase activity, Study the effect of Temperature on Salivary amylase activity, and Study the effect of substrate concentration on salivary amylase activity.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Principles of Biochemistry	Lehninger	W H Freeman & Co	2017
2	Harper's Biochemistry	Robert K. Murry, Daryl K. Granner and Victor W. Rodwell	Mcgraw-hill	2003
3	Biochemistry	D. Satyanarayan and U.Chakrapani	Elsevier	2010
4	Practical Biochemistry	R.C. Gupta and S. Bhargavan	CBS Publishers	2009
5	Practical Biochemistry	Harold Varley	CBS Publishers	2005

PATHOPHYSIOLOGY THEORY (PATHO)

COURSE CODE	22PY1210T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the causes, progression of injury, inflammation and repair	2	1,2
CO2	Understand the causes and pathogenesis of diseases related to cardio vascular system and Central nervous system	2	1,2
CO3	Understand the pathophysiology of diseases related to respiratory system and Gastro Intestinal system	2	1,2
CO4	Understand the concepts of pathogenesis of different communicable diseases and cancer	2	1,2

Syllabus

Module 1	Basic principles of Cell injury and Adaptation: Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death. Acidosis & Alkalosis, Electrolyte imbalance. Basic mechanism involved in the process of inflammation and repair: Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin.
Module 2	Cardiovascular System: Definition, symptoms, causes and Pathophysiology: Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, and atherosclerosis). Haematological Diseases: Definition, symptoms, causes and Pathophysiology: Iron deficiency, megaloblastic anemia (VitB12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia. Nervous system: Epilepsy, Parkinson's disease, and stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.
Module 3	Definition, causes and Pathophysiology of the following: Respiratory system: Asthma, Chronic obstructive airways diseases. Renal system: Acute and chronic renal failure. Diseases of bones and joints: Rheumatoid Arthritis, Osteoporosis, Gout. Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones. Gastrointestinal system: Peptic Ulcer, Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease
Module 4	Definition, symptoms, causes, Modes of transmission and Pathophysiology of the following: Principles of Cancer: Classification, Etiology and pathogenesis of Cancer. Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections. Sexually transmitted diseases: AIDS, Syphilis, Gonorrhoea.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Robbins & Cotran Pathologic Basis of Disease	Vinay Kumar, Abul K. Abas, Jon C. Aster	Elsevier	2014
2	Text book of Pathology	Harsh Mohan	Jaypee	2010
3	Goodman Gilman's The Pharmacological Basis of Therapeutics	Laurence B, Bruce C, Bjorn K	McGraw- Hill	2011
4	Best and Taylor's Physiological basis of medical practice	Best, Charles and Taylor	William and Wilkins	1991
5	Davidson's Principles and Practice of Medicine	Nicki R. Colledge, Brian R. Walker	ELBS/Churchill Livingstone	2010

PHARMACEUTICAL ORGANIC CHEMISTRY-II THEORY (POC II-T)

COURSE CODE	22PY2113T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	POC-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand Aromatic nature and type of chemical reactions of organic compound	2	1
CO2	Understand the reactivity of Polycyclic Aromatic compounds and different Strain theories	2	1
CO3	Understand about substituted Aromatic compounds, their preparation and properties	2	1
CO4	Understand the study of sugars, amino acids, proteins, fats and oils and effects of various parameters	2	1

Syllabus

Module 1	**Aromaticity & aromatic chemistry:** Concept of aromaticity, Huckel's rule & its use in determining the aromatic / nonaromatic character of a compound. A brief coverage of structure of benzene. Detailed coverage of electophilic & nucleophilic aromatic substitution reactions. Reactivity & orientation in these reactions. Reactivity & orientation in mono- substituted benzenes. Benzyne mechanism. Structure and uses of DDT, Saccharin, BHC and Chloramine.
Module 2	**Polycyclic aromatic hydrocarbons:** Syntheses & reactions with mechanisms of bi- & tricyclic fused carbocyclic rings like naphthalene, anthracene, & phenanthrene. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives. **Cycloalkanes*:** Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only. **Bridged rings:** Bridged ring systems & their nomenclature.
Module 3	**Different aromatic classes of compounds:** The following classes of compounds should be taught in detail with respect to their IUPAC / systematic nomenclature, industrial [wherever applicable] & laboratory methods of preparations, physical properties & chemical reactions with emphasis on reaction mechanisms [arrow based] & stereochemistry [wherever applicable]. Phenolic compounds, Aromatic amines, Diazonium salts. Structure and uses of phenol, cresols, resorcinol, naphthols.
Module 4	**Carbohydrates:** Definition & classification. D & L nomenclature in sugars. Mutarotation. Reactions of glucose. Chain extension & chain reduction of a sugar. **Amino acids & proteins:** Definition & classification. D & L Amino acids. Strecker, Gabriel phthalamide methods for the preparation of amino acids. Peptide bond & its formation. Denaturation of proteins. Two protective groups each, for -NH_2 & -COOH functionalities during protein synthesis. Sequencing of a protein by chemical & enzymatic methods. **Fats and Oils:** Fatty acids – reactions. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Organic Chemistry by Morrison and Boyd	Morrison and Boyd	Pearson	2011
2	Organic Chemistry by I.L. Finar	I.L. Finar	Pearson	Vol 1 1973
3	Textbook of Organic Chemistry	B.S. Bahl & Arun Bahl	S Chand	2019
4	Organic Chemistry by P.L.Soni	P.L.Soni	Sultan Chand	1983
5	Reaction and reaction mechanism by Ahluwalia	Ahluwalia	Boca Raton	2002

PHARMCEUTICAL ORGANIC CHEMISTRY-II PRACTICAL (POC II-P)

COURSE CODE	22PY2113P	MODE	Regular	LTPS	0-0-4-0	PRE-REQUISITE	POC-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Preparation of some organic compounds using different types of reactions	3	PO2, PSO2
CO2	Determination of quality of various oils by Acid value, Saponification value, and Iodine value and discuss the purification techniques and their importance in chemistry	3	PO2, PSO2

Syllabus

Module 1	Preparation of Benzanilide/Phenyl benzoate/Acetanilide from Aniline/Phenol/Aniline by acylation reaction; 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ Acetanilide by halogenation (Bromination) reaction; 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction; 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction; 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions; Benzil from Benzoin by oxidation reaction; Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction; Cinnammic acid from Benzaldehyde by Perkin reaction; K. P-Iodo benzoic acid from P-amino benzoic acid.
Module 2	Determination of various oils by Acid value, Saponification value, and Iodine value Recrystallisation and Steam distillation purification techniques.

Reference Books:

S. No	Title	Author(s)	Publisher	Year
1	Practical Organic Chemistry	Mann and Saunders	Orient BlackSwan	1975
2	Vogel's textbook of Practical Organic Chemistry	Arthur Israel Vogel, B. S. Furniss	Longman	1989
3	Advanced Practical organic chemistry	N.K.Vishnoi	Vikas Publishers	2009
4	Introduction to Organic Laboratory Techniques	Pavia, Lampman and Kriz	Thomson Brooks/Cole	2005

PHYSICAL PHARMACEUTICS I THEORY (PP I-T)

COURSE CODE	22PY2114T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Application of several Principles involved in States of Matter and properties of matter and Physicochemical properties of drug molecules	3	1
CO2	Application of interactions of various substances and various factors that influence the Solubility of drugs and mechanisms of solute-solvent interactions	3	1
CO3	Applying Concepts involved in Surface and interfacial phenomenon:	3	1
CO4	Application of Complexation and protein binding and determination of PH in biological systems	3	1

Syllabus

Module 1	"States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapor pressure, sublimation critical point, eutectic mixtures, gases, aerosols– inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism. Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications
Module 2	Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications
Module 3	Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.
Module 4	"Complexation and protein binding: Introduction, Classification of Complexation. Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants. PH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions. "

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Physical Pharmacy	Alfred Martin	Lippincott Williams & Wilkins	2007
2	Text book of Physical Pharmaceutics	C.V.S. Subramanyam	Vallabh Prakashan	2003

PHYSICAL PHARMACEUTICS I PRACTICAL (PP I-P)

COURSE CODE	22PY2114P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Application of several Principles involved in States of Matter and properties of matter and Physicochemical properties of drug molecules and interactions of various substances and various factors that influence the Solubility of drugs and mechanisms of solute-solvent interactions	3	1
CO2	Applying Concepts involved in Surface and interfacial phenomenon, Complexation and protein binding and determination of PH in biological systems	3	1

Syllabus

Module 1	Determination of Partition co- efficient of benzoic acid in benzene and water Determination of Partition co- efficient of Iodine in CCl4 and water Determination the solubility of drug at room temperature Effect of temperature on solubility of drug Determination of critical Solution temperature of Phenol water system Determination of % composition of NaCl in a solution using phenol-water system by CST method
Module 2	Determination of surface tension of given liquids by drop count and dropweight method Determination of critical micellar concentration ofsurfactants Determination of HLB number of a surfactant bysaponification method Determination of Freundlich and Langmuir constants using activated char coal Determination of pKa value byHalf Neutralization/ Henderson Hasselbalch equation Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Physical Pharmacy	Alfred Martin	Lippincott Williams & Wilkins	2007
2	Text book of Physical Pharmaceutics	C.V.S. Subramanyam	Vallabh Prakashan	2003

PHARMACEUTICAL MICROBIOLOGY THEORY (PMB-T)

COURSE CODE	22PY2115T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand methods of identification, cultivation and preservation of various microorganisms	2	1
CO2	To understand the importance and implementation of sterilization in pharmaceutical processing and industry	2	1
CO3	Understand morphology, replication of fungi, virus, and Learn sterility testing of pharmaceutical products.	2	1
CO4	Understand microbiological standardization of Pharmaceuticals.	2	1

Syllabus

Module 1	Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes. Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.
Module 2	Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.
Module 3	Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants. Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.
Module 4	Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic. Types of spoilage, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical Microbiology	W.B. Hugo and A.D. Russel	Blackwell Scientific publications, Oxford London.	2013
2	Industrial Microbiology	Prescott and Dunn.,	CBS Publishers & Distributors, Delhi.	2004
3	Microbiology	Pelczar, Chan Kreig	Tata McGraw Hill edn.	1985
4	Text Book of Microbiology	Ananthnarayan	Orient-Longman, Chennai	2020
5	Fundamentals of Microbiology	Frobisher, Hinsdill et al	W.B. Saunders Company	1974

PHARMACEUTICAL MICROBIOLOGY PRACTICAL (PMB-P)

COURSE CODE	22PY2115P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Study of different equipments used in experimental microbiology, to perform the preparation of culture media and sterilization of glassware. Applying the knowledge of sterilization techniques and isolation of Pure Cultures	3	2
CO2	To apply the staining techniques of bacteria, demonstration of bacterial motility by hanging drop technique. To perform the microbiological assays of antibiotics, sterility testing of pharmaceuticals, biochemical tests of Microorganisms	3	2

Syllabus

Module 1	1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology. 2. Sterilization of glassware, preparation and sterilization of media. 3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations. 4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical). 5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
Module 2	1. Microbiological assay of antibiotics by cup plate method and other methods. 2. Motility determination by Hanging drop method. 3. Sterility testing of pharmaceuticals. 4. Bacteriological analysis of water. 5. Biochemical test

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical Microbiology	W.B. Hugo and A.D. Russel	Blackwell Scientific publications, Oxford London.	2013
2	Industrial Microbiology	Prescott and Dunn.,	CBS Publishers & Distributors, Delhi.	2004
3	Microbiology	Pelczar, Chan Kreig	Tata McGraw Hill edn.	1985
4	Text Book of Microbiology	Ananthnarayan	Orient-Longman, Chennai	2020
5	Fundamentals of Microbiology	Frobisher, Hinsdill et al	W.B. Saunders Company	1974

PHARMACEUTICAL ENGINEERING THEORY (PE-T)

COURSE CODE	22PY2116T	MODE	R	LTPS	3-1-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the concept of flow of fluids and various principles and equipments involved in size separation and size reduction techniques	2	2
CO2	Understand the concept of Heat transfer and principles and equipments involved in evaporation and distillation	2	2
CO3	Apply the concepts of drying and mixing in operation of pharmaceutical manufacturing dosage forms	3	2
CO4	Understand various materials involved in pharmaceutical manufacturing process, principles and equipments involved in filtration and centrifugation	2	2

Syllabus

Module 1	Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturi meter, Pitot tube and Rotameter. Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill. Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.
Module 2	Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator. Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation.
Module 3	Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer. Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.
Module 4	Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seitz filter. Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of

	Perforated basket centrifuge, non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge. Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for pharmaceutical plant construction, Theories of corrosion, types of corrosion and their prevention. Ferrous and nonferrous metals, inorganic and organic nonmetals, basic of material handling systems.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical engineering principles and practices	C.V.S Subrahmanyam	Vallabh Prakashan	2009
2	The Science and practice of pharmacy	Adejaro. A	Elsevier Exclusive	2021
3	Theory and practice of industrial pharmacy	Roop K. Khar	CBS	2020
4	Essentials of Physical Pharmacy	Dr. Derle D. V	PharmaMed Press	2008

PHARMACEUTICAL ENGINEERING PRACTICAL (PE-P)

COURSE CODE	22PY2116P	MODE	Regular	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To know various unit operations used in pharmaceutical industries and material handling techniques	3	2
CO2	Understand various processes involved in pharmaceutical manufacturing process and acquiring knowledge on operation of pharmaceutical manufacturing equipment	3	2

Syllabus

Module 1	Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including, arithmetic and logarithmic probability plots. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill. To study the effect of time on the Rate of Crystallization. Determination of radiation constant of brass, and iron Determination of radiation constant of unpainted and painted glass Steam distillation – To calculate the efficiency of steam distillation To determine the overall heat transfer coefficient by heat exchanger. Factors affecting Rate of Evaporation (Surface area, Concentration and Thickness, viscosity)
Module 2	Construction of drying curves (for calcium carbonate and starch). Determination of moisture content and loss on drying. Determination of humidity of air – i) from wet and dry bulb temperatures – use of Dew point method. To calculate the uniformity Index for given sample by using Double Cone Blender. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment. Factors affecting Rate of Filtration (Surface area, Concentration and Thickness, viscosity)

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical engineering principles and practices	C.V.S Subrahmanyam	Vallabh Prakashan	2009
2	The Science and practice of pharmacy	Adejaro. A	Elsevier Exclusive	2021
3	Theory and practice of industrial pharmacy	Roop K. Khar	CBS	2020
4	Essentials of Physical Pharmacy	Dr. Derle D. V	PharmaMed Press	2008

PHARMACEUTICAL ORGANIC CHEMISTRY-III THEORY (POC III-T)

COURSE CODE	22PY2217T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	POC-II

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Describes stereoisomerism and racemic modification of compound	1	1
CO2	Account for stereregio specific reactions and its nomenclature of given organic compounds	2	1
CO3	Detail study of Heterocyclics, its nomenclature, synthesis and its reactions	2	4
CO4	Description of preparative methods, medicinal uses of heterocyclic drugs and Study of Named reactions.	2	4

Syllabus

Module 1	**Stereo isomerism:** Optical isomerism – Optical activity, enantiomerism, diastereo-isomerism, mesocompounds Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers. Reactions of chiral molecules. Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute.
Module 2	Geometrical isomerism: Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions.
Module 3	**Heterocyclic compounds:** Nomenclature and classification, Synthesis, reactions and medicinal uses offollowing compounds/derivatives Pyrrole, Furan, and Thiophene. Relative aromaticity and reactivity ofPyrrole, Furan and Thiophene.
Module 4	Synthesis, reactions and medicinal uses of following compounds/derivatives, Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives. **Reactions of synthetic importance:** Metal hydride reduction ($NaBH_4$ and $LiAlH_4$), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Organic chemistry- Volume I & II	I.L. Finar	Pearson	2002
2	A text book of organic chemistry	Arun Bahl, B.S. Bahl	S Chand & Co. Ltd	2020
3	Heterocyclic Chemistry	Raj K. Bansal	New Age International	2022
4	Organic Chemistry	Morrison and Boyd	Pearson	2010
5	Heterocyclic Chemistry	T.L. Gilchrist	Pearson	2005

MEDICINAL CHEMISTRY-I THEORY (MC I-T)

COURSE CODE	22PY2218T	MODE	Regular	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the correlation of pharmacology of a disease with physico-chemical properties of drugs	2	1
CO2	Understand the chemistry, metabolic pathways, structure activity relationship and therapeutic value of adrenergic drugs	2	4
CO3	Understand the chemistry, metabolic pathways, structure activity relationship and therapeutic value of cholinergic drugs	2	4
CO4	Understand the chemistry, metabolic pathways, structure activity relationship and therapeutic value of CNS drugs	2	4

Syllabus

Module 1	**Introduction to Medicinal Chemistry:** History and development of medicinal chemistry Physicochemical properties in relation to biological action Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bio-isosterism, Optical and Geometrical isomerism. Drug metabolism Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.
Module 2	**Drugs acting on Autonomic Nervous System Adrenergic Neurotransmitters:** Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution. Sympathomimetic agents: SAR of Sympathomimetic agents Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline. •Indirect acting agents: Hydroxy amphetamine, Pseudoephedrine, Propylhexedrine. •Agents with mixed mechanism: Ephedrine, Metaraminol. Adrenergic Antagonists: Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.
Module 3	**Cholinergic neurotransmitters:** Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. Parasympathomimetic agents: SAR of Parasympathomimetic agents Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine. Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion. Cholinesterase reactivator: Pralidoxime chloride. Cholinergic Blocking agents: SAR of cholinolytic agents Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*. Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.
Module 4	**Drugs acting on Central Nervous System** A. Sedatives and Hypnotics: Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem Barbiturates: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital Miscelleneous: Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde. B. Antipsychotics Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride,

	Prochlorperazine maleate, Trifluoperazine hydrochloride. Ring Analogues of Phenothiazeines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.Fluro buterophenones: Haloperidol, Droperidol, Risperidone. Beta amino ketones: Molindone hydrochloride. Benzamides: Sulpieride. C. Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action Barbiturates: Phenobarbitone, Methabarbital. Hydantoins: Phenytoin*, Mephenytoin, Ethotoin Oxazolidine diones: Trimethadione, Paramethadione Succinimides: Phensuximide, Methsuximide, Ethosuximide* Urea and monoacylureas: Phenacemide, Carbamazepine* Benzodiazepines: Clonazepam Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate. General anesthetics: Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane. Ultrashort acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium. Dissociative anesthetics: Ketamine hydrochloride. *Narcotic and non-narcotic analgesics Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate. Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride. Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.	Charles Owens Wilson	Lippincott Williams & Wilkins	2011
2	Organic Chemistry by I.L. Finar, Vol. II.	I.L. Finar	Pearson	Vol 2 1975
3	Foye's Principles of Medicinal Chemistry	William O. Foye	Wolters Kluwer Health/Lippincott Williams & Wilkins	2013
4	Burger's Medicinal Chemistry, Vol I to IV.	Donald J. Abraham, Michael Myers	Wiley	2021
5	Introduction to principles of drug design-Smith and Williams	H. John Smith, Hywel Williams	CRC Press	2005

MEDICINAL CHEMISTRY-I PRACTICAL (MC I-P)

COURSE CODE	22PY2218P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Perform chemical synthesis of some drugs; Perform chemical synthesis of some intermediates in chemical reactions	3	4
CO2	Perform the assays for few drugs to identify its purity; Determination of a physical property, partition coefficient for few drugs	3	4

Syllabus

Module 1	Preparation of drugs: Benzimidazole, Benztriazole, Benzocaine, Phenytoin, Phenothiazine, Barbiturate. Preparation of intermediates: 1,3-pyrazole, 1,3-oxazole, 2,3- diphenyl quinoxaline,
Module 2	Assay of drugs: Chlorpromazine, Phenobarbitone, Atropine, Ibuprofen, Aspirin, Furosemide. Determination of Physical properties: Partition coefficient for any two drugs

Reference Books:

S. No	Title	Author(s)	Publisher	Year
1	Medicinal Chemistry Practical	Ashutoskar,	New Age International Publishers,	2007
2	Vogel's textbook of Practical Organic Chemistry	Arthur Israel Vogel, B. S. Furniss	Longman	1989
3	Introduction to Organic Laboratory Techniques	Pavia, Lampman and Kriz	Thomson Brooks/Cole	2005
4	Textbook of Medicinal Chemistry, Volume 1 & 2	S. N. Pandeya & S. K. Pandey,	KG Publications	2010

PHYSICAL PHARMACEUTICS II THEORY (PP II-T)

COURSE CODE	22PY2219T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	PP-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Apply the principles of colloidal systems and their properties and rheological behaviour of pharmaceutical systems	3	1,4
CO2	Application of physical parameters in designing of dispersed systems	3	1,4
CO3	Apply the principles of particle surface characteristics in study of powdered materials and application of these concepts in designing of dosageforms	3	1,4
CO4	Apply the principles of chemical kinetics & to use them for stability testing nad determination of expiry date of formulations	3	1,4

Syllabus

Module 1	Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protectiveaction. Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers. Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus.]
Module 2	Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method
Module 3	Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.
Module 4	Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Physical Pharmacy	Alfred Martin	Lippincott Williams & Wilkins	2007
2	Text book of Physical Pharmaceutics	C.V.S. Subramanyam	Vallabh Prakashan	2003

PHYSICAL PHARMACEUTICS II PRACTICAL (PP II-P)

COURSE CODE	22PY2219P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	PP-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Apply the principles of colloidal systems and their properties and rheological behaviour of pharmaceutical systems and physical parameters in designing of dispersed systems	3	1
CO2	Apply the principles of particle surface characteristics in study of powdered materials and application of these concepts in designing of dosage forms and the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations	3	1

Syllabus

Module 1	Determination of viscosity of liquid using Ostwald's viscometer Determination of viscosity of semisolid by using Brookfield viscometer Determination sedimentation volume with effect of different concentration of single suspending agent Determination sedimentation volume with effect of different suspending agent
Module 2	Determination of bulk density, true density and porosity Determination of flow properties of powders Determine influence of lubricant on angle of repose Determination of particle size, particle size distribution using sieving method Determination of particle size, particle size distribution using Microscpy method Determination of reaction rate constant for first order reaction Determination of reaction rate constant forSecond order reaction Accelerated stability studies

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Physical Pharmacy	Alfred Martin	Lippincott Williams & Wilkins	2007
2	Text book of Physical Pharmaceutics	C.V.S. Subramanyam	Vallabh Prakashan	2003

PHARMACOLOGY I THEORY (P. COL I-T)

COURSE CODE	22PY2220T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	Course Outcomes	BTL	PO Mapping
CO1	Understanding the pharmacological actions of different categories of drugs	2	1,4
CO2	Understand the mechanism of drug action at the organ system/subcellular/macromolecular level	2	1,4
CO3	Applying the basic knowledge of pharmacology in PNS	3	1,4
CO4	Applying the effect of drugs on CNS	3	1,4

Syllabus

Module 1	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
Module 2	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
Module 3	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
Module 4	Pharmacology of drugs acting on central nervous system .General anesthetics and pre-anesthetics.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 Alzheimer's disease. CNS stimulants and nootropics. Opioid analgesics and antagonists. Drug addiction, drug abuse, tolerance and dependence.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Rang and Dale's Pharmacology, Churchil Livingstone Elsevier	Rang H. P., Dale M. M., Ritter J. M., Flower R. J.,.	Elsevier	2020
2	Basic and clinical pharmacology,	Katzung B. G., Masters S. B., Trevor A. J.	Lea& Febigur	2018
3	The Pharmacological Basis of Therapeutics	Goodman and Gilman's	Nirali Prakashan	2018
4	Applied Therapeutics, The Clinical use of Drugs, The Point	Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W.		2016
5	Essentials of Medical Pharmacology	KD Tripathy	JP Publishers	2018

PHARMACOLOGY I PRACTICAL (COL I-P)

COURSE CODE	22PY2220P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Application of basic principles of pharmacology and common laboratory techniques	3	2
CO2	Examining drugs using pharmacological equipments(Insilico) and Analysing the effect of drugs on stereotype and catatonic activity	4	3

Syllabus

Module 1	1. Introduction to experimental pharmacology. 2. Commonly used instruments in experimental pharmacology. 3. Study of common laboratory animals. 4. Maintenance of laboratory animals as per CPCSEA guidelines 5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies 6. Study of different routes of drugs administration in mice/rats 7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice
Module 2	1. Effect of drugs on ciliary motility of frog oesophagus 2. Effect of drugs on rabbit eye. 3. Effects of skeletal muscle relaxants using rota-rod apparatus 4. Effect of drugs on locomotors activity using actophotometer. 5. Anticonvulsant effect of drugs by MES and PTZ method. 6. Study of stereotype and anti-catatonic activity of drugs on rats/mice. 7. Study of anxiolytic activity of drugs using rats/mice. 8. Study of local anesthetics by different methods

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Rang and Dale's Pharmacology, Churchil Livingstone Elsevier	Rang H. P., Dale M. M., Ritter J. M., Flower R. J.,.	Elsevier	2020
2	Basic and clinical pharmacology,	Katzung B. G., Masters S. B., Trevor A. J.	Lea& Febigur	2018
3	The Pharmacological Basis of Therapeutics	Goodman and Gilman's	Nirali Prakashan	2018
4	Applied Therapeutics, The Clinical use of Drugs, The Point	Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W.		2016
5	Essentials of Medical Pharmacology	KD Tripathy	JP Publishers	2018

PHARMACOGNOSY AND PHYTOCHEMISTRY I THEORY (PH. COG-I-T)

COURSE CODE	22PY2221T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To know the knowledge of crude drugs and its evaluation	2	1
CO2	To know about the cultivation, collection and processing of crude drugs	2	1
CO3	To know about the traditional systems of medicine and a brief introduction about secondary metabolites	2	1
CO4	To know about the carbohydrate, lipids, enzymes, and marine containing natural drugs	2	1

Syllabus

Module 1	Introduction to Pharmacognosy: Definition, history, scope and development of Pharmacognosy, Sources of Drugs – Plants, Animals, Marine &Tissue culture, Organized drugs, and unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum-resins). Classification of drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs. Quality control of Drugs of Natural Origin: Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.
Module 2	Cultivation, Collection, Processing and storage of drugs of natural origin: Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants. Conservation of medicinal plants Plant tissue culture: Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines.
Module 3	Cultivation, Collection, Processing and storage of drugs of natural origin: Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants. Conservation of medicinal plants Plant tissue culture: Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines.
Module 4	Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: Carbohydrates: Acacia, Agar, Tragacanth, Honey Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). Lipids (Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax Marine Drugs: Novel medicinal agents from marine sources.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text book of Pharmacognosy	C.K. Kokate, Purohit, Gokhlae	Nirali Prakashan, New Delhi	2020
2	Pharmacognosy and Phytochemistry,	Mohammad Ali.	CBS Publishers & Distribution, New Delhi	2019
3	Herbal drug industry	R.D. Choudhary	Eastern Publisher, New Delhi	1996
4	Essentials of Pharmacognosy, ,	Dr. SH. Ansari	Birla publications, New Delhi	2007

PHARMACOGNOSY AND PHYTOCHEMISTRY I PRACTICAL (PH. COG I-P)

COURSE CODE	22PY2221P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Applying the knowledge of chemical evaluation in identifying and physical evaluation of crude drugs	3	1
CO2	Applying the knowledge of microscopical evaluation of crude drugs by linear measurements and leaf constants	3	1

Syllabus

Module 1	Analysis of crude drugs by chemical tests: (i) Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil Determination of Ash value and moisture content of Cinnamon, Determination of extractive value of Acacia, Determination of swelling Index of Isapgol and foaming index of liquorice
Module 2	Determination of number of starch grains by Lycopodium spore method Determination of fiber length and width of cinnamon Determination of size of starch grains Determination of Palisade ratio of Datura Determination of Stomatal number and Stomatal index of Vinca Determination of Vein islet and vein termination number of Datura

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmacognosy	W.C.Evans, Trease and Evans	W.B. Sounders & Co., London	2009
2	Pharmacognosy	Tyler, V.E., Brady, L.R. and Robbers, J.E.	Lea and Febiger, Philadelphia	1988
3	Text book of Pharmacognosy	C.K. Kokate, Purohit, Gokhlae	Nirali Prakashan, New Delhi	2007
4	Practical Pharmacognosy	C.K. Kokate, Purohit, Gokhlae	Nirali Prakashan, New Delhi	2020

MEDICINAL CHEMISTRY-II THEORY (MC-II-T)

COURSE CODE	22PY3122T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	MC-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding the nomenclature, chemistry, metabolism, structure-activity relationship, mechanism of action, synthesis (few drugs) and uses of antihistamineand antineoplastic drugs	2	1
CO2	Understanding the nomenclature, chemistry, metabolism, structure-activity relationship, mechanism of action, synthesis (few drugs) and uses of anti-anginal, antihypertensive and diuretic drugs	2	1
CO3	Applying the knowledge of the nomenclature, chemistry, metabolism, structure- activity relationship, mechanism of action, synthesis (few drugs) and uses of anti-arrhythmic, anticoagulant, antihyperlipidemic and local anaesthetic drugs and drug used in cardiac failure	3	1,4
CO4	Applying the knowledge of the nomenclature, chemistry, metabolism, structure-activity relationship, mechanism of action, synthesis (few drugs) and uses of antidiabetic drugs, hormones and steroid drugs	3	1,4

Syllabus

Module 1	**Antihistaminic agents:** Histamine, receptors and their distribution in the humanbody. **H1–antagonists**: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidaminetartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium. **H2-antagonists:** Cimetidine*, Famotidine, Ranitidin. **Gastric Proton pump inhibitors:** Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole. **Anti-neoplastic agents: Alkylating agents:** Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa. **Antimetabolites:** Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine. **Antibiotics:** Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate **Miscellaneous:** Cisplatin, Mitotane.
Module 2	**Anti-anginal: Vasodilators:** Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole. **Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. **Diuretics:** Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. **Thiazides:** Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide, **Loop diuretics:** Furosemide*, Bumetanide, Ethacrynic acid. **Potassium sparing Diuretics:** Spironolactone, Triamterene, Amiloride. **Osmotic Diuretics:** Mannitol. **Anti-hypertensive Agents:** Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopatehydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

Module 3	**Anti-arrhythmic Drugs:** Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol. **Anti-hyperlipidemic agents:** Clofibrate, Lovastatin, Cholesteramine and Cholestipol. **Coagulant & Anticoagulants:** Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel. **Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan. **Local Anesthetics**: SAR of Local anesthetics. Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.**Amino Benzoic acid derivatives:** Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.**Miscellaneous:** Phenacaine, Diperodon, and Dibucaine. *
Module 4	**Antidiabetic agents:** Insulin and its preparations, **Sulfonyl ureas:** Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. **Biguanides:** Metformin.**Thiazolidinediones:** Pioglitazone, Rosiglitazone. **Meglitinides:** Repaglinide, Nateglinide.**Glucosidase inhibitors**: Acrabose, Voglibose. **Drugs acting on Endocrine system:** Nomenclature, Stereochemistry and metabolism of steroids Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol. **Drugs for erectile dysfunction:** Sildenafil, Tadalafil. **Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol. Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone T**hyroid and antithyroid drugs**: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text Book of Medicinal Chemistry	S. N. Pandeya & S. K. Pandey	KG Publications	2020
2	Text Book of Medicinal Chemistry	Ashutoskar	New Age International Publishers	2020
3	Organic Medicinal and Pharmaceutical Chemistry	Wilson & Giswold's	Wolters Kluwer	2022
4	Principles of Medicinal Chemistry	Foye	Wolters Kluwer	2022
5	Medicinal Chemistry	Burger's	Wiley Publications	2018

INDUSTRIAL PHARMACY-I THEORY (IP I-T)

COURSE CODE	22PY3123T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Know about Physicochemical properties of drug that influences the performance of drug and dosage from.	1	1
CO2	Understand the formulation, manufacturing, evaluation of tablets, liquid orals, capsules and pelletization.	2	1
CO3	Know about different considerations related to parenterals and ophthalmic products	2	1
CO4	Understand the formulation, preparation and evaluation of cosmetics and aerosols. A note on packaging materials for pharmaceutical products	2	1

Syllabus

Module 1	**Preformulation Studies:** Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.
Module 2	**Tablets:** a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients,Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling. b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. c. Quality control tests: In process and finished product tests. **Liquid orals:** Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia. **Capsules: a**.**Hard gelatin capsules:** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules. **b**. **Soft gelatin capsules:** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications. **Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets.

Module 3	**Parenteral Products: a**. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity b. Production procedure, production facilities and controls, aseptic processing c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products. d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products. **Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations.
Module 4	**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens. **Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies. **Packaging Materials Science:** Materials used forpackaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

Reference Books:

S. No	Title	Author	Publisher	Year
1	Pharmaceutical dosage forms - Tablets	H.A. Liberman, Leon Lachman & J.B.Schwartz	CRC Press Inc	2008
2	Modern Pharmaceutics	Banker	CRC Press Inc	2002
3	The Science and Practice of Pharmacy	Remington	Elsivier	2021
4	Theory and Practice of Industrial Pharmacy	Leon Lachman	CBS Publishers	2020
5	Pharmaceutics - The science of dosage form design	Aulton	Elsivier	2018

In-Sem Summative	Semester in Exam-I	7.5	15
	Semester in Exam-II	7.5	
End-Sem Summative	End Semester Exam	75	75

INDUSTRIAL PHARMACY-I PRACTICAL (IP I-P)

COURSE CODE	22PY3123P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Know about Physicochemical properties of drug that influences the performance of drug and dosage from, Applying the preparation and evaluation of capsules and coated tablets.	3	2
CO2	Analyzing the preparation and evaluation of injections, Analyzing the evaluation of creams	4	3

Syllabus

Module 1	Preformulation studies on paracetamol/aspirin/or any other drug Preparation and evaluation of Paracetamol tablets Preparation and evaluation of Aspirin tablets Coating of tablets- film coating of tablets/granules Preparation and evaluation of Tetracycline capsules
Module 2	Preparation of Calcium Gluconate injection Preparation of Ascorbic Acid injection Quality control test of (as per IP) marketed tablets and capsules Preparation of Eye drops/ and Eye ointments Preparation and evaluation of cold cream Preparation and evaluation of vanishing cream

Reference Books:

S. No	Title	Author	Publisher	Year
1	Pharmaceutical dosage forms - Tablets by	H.A. Liberman, Leon Lachman & J.B.Schwartz	CRC Press Inc	2008
2	Modern Pharmaceutics by	Banker	CRC Press Inc	2002
3	The Science and Practice of Pharmacy	Remington	Elsivier	2021
4	Theory and Practice of Industrial Pharmacy by	Leon Lachman	CBS Publishers	2020
5	Pharmaceutics - The science of dosage form design by	Aulton	Elsivier	2018

PHARMACOLOGY II THEORY (P. COL II-T)

COURSE CODE	22PY3124T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	P. Col-I

Course Outcomes

CO#	Course Outcomes	BTL	PO Mapping
CO1	Understanding Pharmacology of cardio vascular system drugs: congestive heart failure drugs, Anti-hypertensive drugs, Anti-anginal drugs, Anti-arrhythmic drugs, Anti-hyperlipidemic drugs.	2	1
CO2	Understanding the pharmacology of shock, Hematinics, coagulants and anticoagulants, Fibrinolytics and anti-platelet drugs, diuretics and autocoids	2	1
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	1
CO4	Applying the Principles of Bioassays &understanding estrogens, progesterone and oral contraceptives. Drugs acting on the uterus	3	1, 4

Syllabus

Module 1	**Pharmacology of drugs acting on cardiovascular system:** Introduction to hemodynamic and electrophysiology ofheart. Drugs used in congestive heart failure Anti-hypertensive drugs. Anti-anginal drugs. Anti-arrhythmic drugs. Anti-hyperlipidemic drugs. **Pharmacology of drugs acting on cardiovascular system:** Drug used in the therapy of shock. Hematinics, coagulants and anticoagulants. Fibrinolytics and anti-platelet drugs. Plasma volume expanders
Module 2	**Pharmacology of drugs acting on urinary system:** Diuretics, Anti-diuretics. **Autocoids and related drugs:** Introduction to autacoids and classification, Histamine, 5-HT and their antagonists. Prostaglandins, Thromboxanes and Leukotrienes. Angiotensin, Bradykinin and Substance P. Non- steroidal anti-inflammatoryagents, Anti-gout drugs, Antirheumatic drugs
Module 3	**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 Vitamin-D. Insulin, Oral Hypoglycemic agents and glucagon. ACTH and corticosteroids
Module 4	a) **Pharmacology of drugs acting on endocrine system:** Androgens and Anabolic steroids. Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus. **Bioassay:** Principles and applicationsof bioassay. b. Types of bioassay Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT..

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Rang and Dale's Pharmacology, Churchil Livingstone Elsevier	Rang H. P., Dale M. M., Ritter J. M., Flower R. J.,.	Elsevier	2020
2	Basic and clinical pharmacology,	Katzung B. G., Masters S. B., Trevor A. J.	Lea& Febigur	2018
3	The Pharmacological Basis of Therapeutics	Goodman and Gilman's	Nirali Prakashan	2018
4	Applied Therapeutics, The Clinical use of Drugs, The Point	Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W.		2016
5	Essentials of Medical Pharmacology	KD Tripathy	JP Publishers	2018

PHARMACOLOGY II PRACTICAL (P. COL-II-P)

COURSE CODE	22PY3124P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	P. Col-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Analysing the pharmacological activity of drugs on Cardiac and Renal system and dose responses on isolated tissues (Insilco	4	2
CO2	Examining the potency of drugs by Bioassays and Analysing the effect of drugs on analgesic and inflammation	4	3

Syllabus

Module 1	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 abdominis muscle and rat ileum respectively.
Module 2	1. Bioassay of histamine using guinea pig ileum by matching method. 2. Bioassay of oxytocin using rat uterine horn by interpolation method. 3. Bioassay of serotonin using rat fundus strip by three-point bioassay. 4. Bioassay of acetylcholine using rat ileum/colon by four-point bioassay. 5. Determination of PA2 value of prazosin using rat anococcygeal muscle (by Schilds plot method). 6. Determination of PD2 value using guinea pig ileum. 7. Effect of spasmogens and spasmolytics using rabbit jejunum

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Rang and Dale's Pharmacology, Churchil Livingstone Elsevier	Rang H. P., Dale M. M., Ritter J. M., Flower R. J.,.	Elsevier	2020
2	Basic and clinical pharmacology,	Katzung B. G., Masters S. B., Trevor A. J.	Lea& Febigur	2018
3	The Pharmacological Basis of Therapeutics	Goodman and Gilman's	Nirali Prakashan	2018
4	Applied Therapeutics, The Clinical use of Drugs, The Point	Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W.		2016
5	Essentials of Medical Pharmacology	KD Tripathy	JP Publishers	2018

PHARMACOGNOSY AND PHYTOCHEMISTRY -II THEORY (P. COG II-T)

COURSE CODE	22PY3125T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	P. Cog-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the importance of the basic metabolic pathways occurring in higher plants	2	1
CO2	Understand the importance of biological sources of various crude drugs	2	1
CO3	Understand the extraction procedures of crude drugs	2	2
CO4	Production of the phytoconstituents and identification of it.	3	2

Syllabus

Module 1	Metabolic pathways in higher plants and their determination: Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.
Module 2	General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites: Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis. Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, Tannins: Catechu, Pterocarpus. Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony. Glycosides: Senna, Aloes, Bitter Almond. Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids
Module 3	Basics of Phytochemistry: Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs. Terpenoids: Menthol, Citral, Artemisin. Glycosides: Glycyrhetinic acid & Rutin. Alkaloids: Atropine, Quinine, Reserpine, Caffeine. Resins: Podophyllotoxin, Curcumin.
Module 4	Industrial production, estimation, and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Herbal drug industry	R.D Chowdary	Eastern Publisher, New Delhi.	1996
2	Herbal Cosmetics	HK.Pande,.	Asia Pacific Business press, Inc, New Delhi	2015
3	Plant cell Biotechnology	R Endress	Springer-Verlag, Berlin	1994
4	Textbook of Biotechnology	Vyas and Dixit.	**CBS PUBLISHERS**	2007
5	Textbook of Biotechnology	RC. Dubay	S.Chand publications	1993

PHARMACOGNOSY AND PHYTOCHEMISTRY -II PRACTICAL (P. COG II-P)

COURSE CODE	22PY3125P	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	P. Cog-I

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Identification of phytoconstituents in the crude drug by chemical tests	2	3
CO2	Isolation and detection of Phytoconstituents from crude drugs	2	3

Syllabus

Module 1	1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander 2. Exercise involving isolation & detection of active principles a. Caffeine - from tea dust. b. Diosgenin from Dioscorea c. Atropine from Belladonna d. Sennosides from Senna 3. Separation of sugars by Paper chromatography 4. TLC of herbal extract
Module 2	1. Distillation of volatile oils and detection of phytoconstitutents by TLC 2. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh 3. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander 4. Exercise involving isolation & detection of active principles

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Herbal drug industry	R.D Chowdary	Eastern Publisher, New Delhi.	1996
2	Herbal Cosmetics	HK.Pande,.	Asia Pacific Business press, Inc, New Delhi	2015
3	Plant cell Biotechnology	R Endress	Springer-Verlag, Berlin	1994
4	Textbook of Biotechnology	Vyas and Dixit.	**CBS PUBLISHERS**	2007
5	Textbook of Biotechnology	RC. Dubay	S.Chand publications	1993

PHARMACEUTICAL JURISPRUDENCE THEORY (PJT)

COURSE CODE	22PY3126T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.	2	PO8
CO2	Various Indian Pharmaceutical Acts and Laws	2	PO8
CO3	The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals	2	PO8
CO4	The code of ethics during the pharmaceutical practice	2	PO8

Syllabus

Module 1	**Drugs and Cosmetics Act, 1940 and its rules 1945**: Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.
Module 2	**Drugs and Cosmetics Act, 1940 and its rules 1945**: Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties. Labelling & packing of drugs- General labelling requirements and specimen labels for drugs and cosmetics, List of permitted colours. Offences and penalties. **Administration of the Act and Rules** – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, licensing authorities, controlling authorities, Drugs Inspectors.
Module 3	**Pharmacy Act –1948**: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and penalties. **Medicinal and Toilet Preparation Act –1955**: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties. **Narcotic Drugs and Psychotropic substances Act-1985 and Rules:** Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, Opium poppy cultivation and production of poppy straw, manufacture, sale and export of Opium, Offences and Penalties.
Module 4	Study of Salient Features of **Drugs and Magic Remedies Act and its rules**: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties. **Prevention of Cruelty to animals Act-1960**: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties. **National Pharmaceutical Pricing Authority**: Drugs Price Control Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, **National List of Essential Medicines (NLEM). Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquiry

	committee, Health survey and development committee, Hathi committee and Mudaliar committee. Code of Pharmaceutical ethics Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath. **Medical Termination of Pregnancy Act**. Right to Information Act. Introduction to Intellectual Property Rights.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Forensic Pharmacy	B.Suresh	CBS Publishers & Distributors	2022
2	Text book of Forensic Pharmacy	R.M.Mithal	**Vikas Publishing House**	2016
3	Hand book of drug law	M.L.Mehra	Jain publishers	2023
4	A text book of Forensic Pharmacy	N.K.Jain	Vallabh Prakashan2	2017
5	Text book of Forensic Pharmacy	C.K.Kokate	Pharmamed Press	2012

MEDICINAL CHEMISTRY-III THEORY (MC-III-T)

COURSE CODE	22PY3277T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	MC-II

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the chemistry, SAR, classification of different Beta - lactam, Aminoglycoside, Tetracyclines, Macrolide's antibiotics, and the concept of prodrug.	1,2	1, 3, 8
CO2	Understand the chemistry, SAR, classification of different Antimalarials, Anti tubercular agents, Anti protozoal, Anthelmintics antibiotics.	1,2	1,3,8
CO3	Understand the chemistry, SAR, classification of different Urinary tract Anti-Infective agents, Anti- viral, Anti-fungal antibiotics.	1,2	1, 3, 8
CO4	Understand the chemistry, SAR, classification of different Sulfonamides and sulfones. Know the importance of QSAR of drugs rug design and combinatorial chemistry	1,3	1, 3, 8

Syllabus

Module 1	Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. β-Lactam antibiotics: Penicillin, Cephalosporins, β- Lactamase inhibitors, Monobactams Aminoglycosides: Streptomycin, Neomycin, Kanamycin Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline. Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. Macrolide: Erythromycin Clarithromycin, Azithromycin. Miscellaneous: Chloramphenicol*, Clindamycin. Prodrugs: Basic concepts and application of prodrugs design
Module 2	Antimalarials: Etiology of malaria. Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine. Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil. Miscellaneous: Pyrimethamine, Artesunate, Artemether, Atovaquone. Anti- tubercular Agents Synthetic anti-tubercular agents: Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid. * Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycin, Capreomycin sulphate. Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine. Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.
Module 3	Urinary tract anti-infective agents Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin Miscellaneous: Furazolidine, Nitrofurantoin*,Methanamine.Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Ganciclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirdine, Ribavirin, Saquinavir, Indinavir, Ritonavir. IV Antifungal agents: Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin. Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconazole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Module 4	Sulphonamides and Sulfones Historical development, chemistry, classification and SAR of Sulfonamides: Sulphathiazole, Sulfisoxazole, Sulphathiazole, Sulfacetamide*, Sulphapyridine, Sulfamethoxazole*, Sulphadiazine, Mefenideacetate, Sulfasalazine.Folatereductaseinhibitors: Trimethoprim*, Cotrimoxazole. Sulfones: Dapsone*. Introduction to Drug Design Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR)such as partition coefficient, Hammett's electronic parameter, Taft steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques. Combinatorial Chemistry: Concept and applications chemistry: solid phase and solution phase synthesis. of combinatorial

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text Book of Medicinal Chemistry	S. N. Pandeya & S. K. Pandey	KG Publications	2020
2	Text Book of Medicinal Chemistry	Ashutoskar	New Age International Publishers	2020
3	Organic Medicinal and Pharmaceutical Chemistry	Wilson & Giswold's	Wolters Kluwer	2022
4	Principles of Medicinal Chemistry	Foye	Wolters Kluwer	2022
5	Medicinal Chemistry	Burger's	Wiley Publications	2018

MEDICINAL CHEMISTRY-III PRACTICAL (MC-III-P)

COURSE CODE	22PY3277P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	MC-II

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Preparation of drugs and intermediates, Assay of drugs, Preparation of medicinally important compounds or intermediates by Microwave irradiation technique	3	2
CO2	Drawing structures and reactions using chem draw® Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)	3	2

Syllabus

Module 1	**I Preparation of drugs and intermediates** 1. Sulphanilamide 2. 7-Hydroxy, 4-methyl coumarin 3. Chlorobutanol 4. Triphenyl imidazole 5. Tolbutamide 6. Hexamine **II Assay of drugs** 1. Isonicotinic acid hydrazide 2. Chloroquine 3. Metronidazole 4. Dapsone 5. Chlorpheniramine maleate 6. Benzyl penicillin **III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique**
Module 2	Drawing structures and reactions using chem draw® Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text Book of Medicinal Chemistry	S. N. Pandeya & S. K. Pandey	KG Publications	2020
2	Text Book of Medicinal Chemistry	Ashutoskar	New Age International Publishers	2020
3	Organic Medicinal and Pharmaceutical Chemistry	Wilson & Giswold's	Wolters Kluwer	2022
4	Principles of Medicinal Chemistry	Foye	Wolters Kluwer	2022
5	Medicinal Chemistry	Burger's	Wiley Publications	2018

Pharmacology-III Theory (P. Col-III-T)

COURSE CODE	22PY3228T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	P. Col-II

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases	2	1
CO2	Understand the mechanism of drug action antibiotics and drugs used commonly infected diseases	2	1
CO3	Understand the immunopharmacology	2	1
CO4	Comprehend the principles of toxicology and treatment of various poisonings	2	1

Syllabus

Module 1	**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.
Module 2	**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
Module 3	**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
Module 4	**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 poisoning

	d. 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:

Sl No	Title	Author(s)	Publisher	Year
1	P. Goodman and Gilman's The pharmacological Basis of therapeutics.	Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor	Mc Graw Hill, Pergamon press.	2017
2	Modern Pharmacology	Craig, C.R. and Stitzel, R.E	Little Brown and company.	2004
3	Basic and clinical pharmacology	Katzung, B.G	Prentice Hall, International	2017
4	Pharmacology	Rang, H.P. and Dale, M.M.	Churchill Living stone	2004
5	Essentials of medical pharmacology	Tripathi, K. D	Jaypee, Delhi	2003

PHARMACOLOGY-III PRACTICAL (P. COL-III-P)

COURSE CODE	22PY3228P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	P. Col-II

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Obtain 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	2
CO2	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	2

Syllabus

Module 1	1. Dose calculation in pharmacological experiments 2. Antiallergic activity by mast cell stabilization assay 3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model. 4. Study of effect of drugs on gastrointestinal motility 5. Effect of agonist and antagonists on guinea pig ileum 6. Estimation of serum biochemical parameters by using semi-auto analyser 7. Effect of saline purgative on frog intestine
Module 2	1. Insulin hypoglycaemic effect in rabbit 2. Test for pyrogens (rabbit method) 3. Determination of acute oral toxicity (LD50) of a drug from a given data 4. Determination of acute skin irritation / corrosion of a test substance 5. Determination of acute eye irritation / corrosion of a test substance 6. Calculation of pharmacokinetic parameters from a given data 7. Biostatistics methods in experimental pharmacology (student's t test, ANOVA) 8. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Fundamentals of Experimental Pharmacology	M. N. Ghosh	Hilton and Company	2008
2	Hand book of Experimental Pharmacology	S. K. Kulakarni	Vallabh Prakashan	2014
3	CPCSEA guidelines for laboratory animal facility.		Ministry of Environment, forest,climate change government of India	2018
4	Drug discovery and Evaluation by	Vogel H.G.	Springer	1996
5	Introduction to biostatistics and research methods	PSS Sundar Rao and J Richard	PHI Learning Pvt. Ltd.	2012

HERBAL DRUG TECHNOLOGY THEORY (HDT-T)

COURSE CODE	22PY3229T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Apply the knowledge on formulation of Ayurvedic dosage form understand raw material as source of herbal drugs from cultivation to herbal drug product.	4	3
CO2	Understand the concept of Nutraceuticals and their role in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastrointestinal diseases	4	2
CO3	Apply the knowledge on formulation of Herbal Cosmetics using Herbal excipients	4	3
CO4	Understand the WHO and ICH guidelines for evaluation of herbal drugs. Understand Regulatory Issues -Regulations in India and Schedule T	4	2

Syllabus

Module 1	**Herbs as raw materials** Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs Selection, identification and authentication of herbal materials Processing of herbal raw material **Biodynamic Agriculture** Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Bio pesticides/Bio insecticides. **Indian Systems of Medicine** a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika,Churna, Lehya and Bhasma.
Module 2	**Nutraceuticals** General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina **Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper
Module 3	**Herbal Cosmetics** Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products. **Herbal excipients:**

	Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes. **Herbal formulations :** Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes **Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.
Module 4	**Patenting and Regulatory requirements of natural products:** b) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy c) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem. **Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs. **General Introduction to Herbal Industry** Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India. S**chedule T – Good Manufacturing Practice of Indian systems of medicine** Components of GMP (Schedule – T) and its objectives Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Textbook of Pharmacognosy	Trease &Evans.	Saunders	2009
2	Textbook of Pharmacognosy	Tyler, Brady & Robber.	Lea& Febigur	1997
3	Pharmacognosy	Kokate, Purohit andGokhale	Nirali Prakashan	2018
4	Essential of Pharmacognosy	Dr.S.H.Ansari	**Birla PUBLICATIONS**	2016
5	Pharmacognosy & Phytochemistry	V.D.Rangari	Career publications	2017

HERBAL DRUG TECHNOLOGY PRACTICAL (HDT-P)

COURSE CODE	22PY3229P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Test for preliminary phytochemical screening and determination of phytochemical constituents	4	3
CO2	Evaluation of natural origins and application of herbal products in cosmetics	4	2

Syllabus

Module 1	1. To perform preliminary phytochemical screening of crude drugs. 2. Determination of the alcohol content of Asava and Arista 3. Evaluation of excipients of natural origin 4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation. 5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopeial requirements. 6. Monograph analysis of herbal drugs from recent Pharmacopoeias
Module 2	1. Determination of Aldehyde content 2. Determination of Phenol content 3. Determination of total alkaloids 4. To perform preliminary phytochemical screening of crude drugs. 5. Determination of the alcohol content of Asava and Arista 6. Evaluation of excipients of natural origin Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Textbook of Pharmacognosy	Trease &Evans.	Saunders	2009
2	Textbook of Pharmacognosy	Tyler, Brady & Robber.	Lea& Febigur	1997
3	Pharmacognosy	Kokate, Purohit andGokhale	Nirali Prakashan	2018
4	Essential of Pharmacognosy	Dr.S.H.Ansari	**Birla PUBLICATIONS**	2016
5	Pharmacognosy & Phytochemistry	V.D.Rangari	Career publications	2017

BIO PHARMACEUTICS AND PHARMACOKINETICS THEORY (BPPK)

COURSE CODE	22PY3230T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.	2	1
CO2	To understand the concepts of bioavailability and bioequivalence of drug products and their significance.	2	1
CO3	To understand the Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination	2	1
CO4	To Understand various pharmacokinetic parameters, their significance & applications.	2	1

Syllabus

Module 1	Introduction to Biopharmaceutics. Absorption: Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from non-per oral extra vascular routes. Distribution: Tissue permeability of drugs, binding of drugs, apparent volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding.
Module 2	Elimination: Drug metabolism and basic understanding of metabolic pathways, renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, non-renal routes of drug excretion. Bioavailability and Bioequivalence: Definition and objectives of bioavailability, Bioavailability protocol, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro in-vivo correlations, bioequivalence studies, methods to enhance the dissolution rate and bioavailability of poorly soluble drugs.
Module 3	Pharmacokinetics: Definition and introduction to pharmacokinetics, compartment models, non-compartment models, physiological models. One compartment open model (a) Intravenous injection (Bolus), (b) Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters: KE, t1/2, Vd, AUC, Ka, ClT and CLR: definitions, methods of eliminations, understanding of their significance and application, Urinary excretion methods. Dose adjustment in renal impaired patients.
Module 4	Multicompartment models: Two compartment open model - IV bolus. Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical setting. Non-linear pharmacokinetics: Introduction, factors causing non-linearity. Michaelis-menton method of estimating parameters, explanation with example of drugs.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Dissolution, Bioavailability and Bioequivalence	Abdou H.M, Mack,	Pennsylvania	2008
2	Biopharmaceutics and Clinical Pharmacokinetics	Robert F. Notari, Marcel Dekker Inn, New York and Basel	New York and Basel	2018
3	Remington's Pharmaceutical Sciences Mack	Mack	Pennsylvania	1992
4	Applied Biopharmaceutics and Pharmacokinetics	Leon Shargel and Andrew B.C. YU	Prentice-Hall International edition, USA.	2016
5	Biopharmaceutics and Pharmacokinetics	V. Venkateswarlu	Pharma Book Syndicate	2020

PHARMACEUTICAL BIOTECHNOLOGY THEORY (PBT)

COURSE CODE	22PY3231T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding the importance of Immobilized enzymes in Pharmaceutical Industries	2	1,6
CO2	Genetic engineering applications in relation to production of pharmaceuticals	2	1,6
CO3	Understanding the importance of immunity and Importance of preparation of immunological preparation and Monoclonal antibodies in Industries	2	1,6
CO4	Appreciate the use of microorganisms in fermentationtechnology	2	1,6

Syllabus

Module 1	a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.c)Biosensors-Workingandapplications of biosensors in Pharmaceutical Industries.d)Brief introduction to Protein Engineering.e)Use of microbes in industry. Production ofEnzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.f)Basic principles of genetic engineering.
Module 2	a)Study of cloning vectors, restriction endonucleases and DNA ligase.b) Recombinant DNA technology. Application of genetic engineering in medicine.c)Application of r DNA technology and genetic engineering in the production of:i) Interferon ii) Vaccines-hepatitis- B iii) Hormones-Insulin. d) Brief introduction to PCR
Module 3	Types of immunity- humoral immunity, cellular immunity: a)Structure of Immunoglobulins, b) Structure and Function of MHC, c)Hypersensitivity reactions, Immune stimulation and Immune suppressions. d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.e)Storage conditions and stability of official vaccines, f)Hybridoma technology-Production, Purification and Applications, g)Bloodproductsand Plasma Substituties
Module 4	a)Immuno blotting techniques- ELISA, Western blotting, Southern blotting.b) Genetic organization of Eukaryotes and Prokaryotes. c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. d)Introduction to Microbial biotransformation and applications. e)Mutation: Types of mutation/mutants. a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.b)Large scale production fermenter design and its various controls. c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d)Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substituties.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Molecular Biotechnology: Principles and Applications of Recombinant DNA:	B.R. Glick and J.J. Pasternak	ASM Press Washington D.C	2022
2	Kuby Immunology	RA Goldshy	W.H. Freeman	2018
3	Monoclonal Antibodies	J.W. Goding	Academic Press	1996
4	Molecular Biology and Biotechnology	J.M. Walker and E.B. Gingold	Royal Society of Chemistry	2016
5	Immobilized Enzymes	Zaborsky	CRC Press	1984
6	Molecular Biotechnology (Second Edition)	S.B. Primrose	Blackwell Scientific Publication	1987
7	Principles of fermentation technology, 2nd edition	Stanbury F., P., Whitakar A., and Hall J., S	Aditya books Ltd., New Delhi.	1998

QUALITY ASSURANCE THEORY (QA)

COURSE CODE	22PY3232T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the cGMP aspects in a pharmaceutical industry	2	1
CO2	Understand the importance of organization and personnel	2	1
CO3	Understand the scope of quality certifications applicable to pharmaceutical industries	2	1
CO4	Understand the responsibilities of QA & QC departments	2	1

Syllabus

Module 1	**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP. Total Quality Management (TQM): Definition, elements, philosophies. ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines. Quality by design (QbD): Definition, overview, elements of QbD program, tools ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration NABL accreditation: Principles and procedures
Module 2	**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials
Module 3	**Quality Control:** Quality control test for containers, rubber closures and secondary packing materials. Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.
Module 4	**Document maintenance in pharmaceutical industry:** Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records. Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation. Warehousing: Good warehousing practice, materials management.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	How to Practice GMP's	P P Sharma	Vandana Publications	2015
2	A guide to Total Quality Management-	Kushik Maitra and Sedhan K Ghosh	Vandana Publications	2015
3	Total Quality Management	Besterfield	Pearson Education	1995
4	Good Laboratory Practice Regulations	Sandy Weinberg	CRC Press	2000

INSTRUMENTAL METHODS OF ANALYSIS THEORY (IMA-T)

COURSE CODE	22PY4133T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the intensity and wavelength distribution of absorption and emission spectrum after excitation by a certain spectrum of light	2	2
CO2	Interpret chemical compounds by molecular vibrations and identify chemical elements by measuring emitted light intensity, on absorption of optical radiation by free atoms and measuring intensities of scattered and emitted light through samples	2	2
CO3	Know concepts of Chromatography and techniques used in resolving complex mixtures into individual compounds.	2	2
CO4	Acquire knowledge on various instrumental procedure involving Chromatographic principles.	2	2

Syllabus

Module 1	UV Visible spectroscopy: Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. Applications - Spectrophotometric titrations, Single component and multi component analysis. Fluorimetry: Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications
Module 2	IR spectroscopy: Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations. Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector andapplications. Flame Photometry-Principle, interferences, instrumentation and applications.Atomic absorption spectroscopy-Principle, interferences, instrumentation and applications.Nepheloturbidometry-Principle, instrumentation and applications
Module 3	Introduction to chromatography: Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications. Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications. Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications. Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Instrumental Methods of Chemical Analysis	B.KSharma	Krishna's Educational publishers, 30th Edition	2014
2	Organic spectroscopy	YR Sharma	S Chand lmt	2013
3	Organic Chemistry by I.L. Finar	I.L. Finar	Pearson	1973
4	Vogel's Text book of Quantitative Chemical Analysis	AI Vogel	Pearson	2009

INSTRUMENTAL METHODS OF ANALYSIS PRACTICAL (IMA-P)

COURSE CODE	22PY4133P	MODE	R	LTPS	0-0-4-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Estimation of samples by using UV, Colorimetry, Fluorimetry	2	2, 4
CO2	Estimation of samples by using Flame photometry, Nephelo turbidometry, paper chromatography, thin layer chromatography, column chromatography, HPLC, Gas Chromatography.	2	2, 4

Syllabus

Module 1	Determination of absorption maxima and effect of solvents on absorption maxima of organic compound. Estimation of dextrose by colorimetry, Estimation of sulphanilamide by colorimetry, Simultaneous estimation of ibuprofen and Paracetamol by UV Spectroscopy, Assay of Paracetamol by UV Spectroscopy, Estimation of Quinine sulphate by Fluorimetry, Study of quenching of Fluorescence
Module 2	Determination of sodium by flame photometry, Determination of potassium by flame photometry, Determination of chlorides and sulphates by Nephiloturbidometry, Separation of amino acids by paper chromatography, Separation of sugars by thin layer chromatography, Separation of plant pigments by column chromatography, Demonstration experiment on HPLC, Demonstration experiment on Gas Chromatography

Reference Books:

S. No	Title	Author(s)	Publisher	Year
1	Instrumental methods of analysis	Gurudeep Chatwal	HPH Publishers	2013
2	Vogel's textbook of Practical Organic Chemistry	Arthur Israel Vogel, B. S. Furniss	Longman	1989
3	Instrumental Methods of Chemical Analysis	B.KSharma	Krishna's Educational publishers, 30th Edition	2014
4	Organic spectroscopy	YR Sharma	S Chand lmt	2013

INDUSTRIAL PHARMACY-II THEORY (IP-II)

COURSE CODE	22PY4134T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the process of pilot plant and scale up of pharmaceutical dosage forms	2	1,4
CO2	Understand the process of technology transfer from lab scale to commercial batch	2	1,4
CO3	Understand different Laws and Acts that regulate pharmaceutical industry	2	1,4
CO4	Application of the approval process and regulatory requirements for drug products	3	1,4

Syllabus

Module 1	**Pilot plant scale up techniques:** General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology.
Module 2	**Technology development and transfer:** WHO guidelines for Technology Transfer (TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues
Module 3	**Regulatory affairs-**Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals. Regulatory requirements for drug approval- Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug IND Application, Investigator's Brochure IB and New Drug Application NDA, Clinical research or BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

Module 4	**Quality management systems-** Quality management and Certifications- Concept of Quality, Total Quality Management, Quality by Design QbD, Six Sigma concept, Out of Specifications OOS, Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP. Indian Regulatory Requirements- Central Drug Standard Control Organization CDSCO and State Licensing Authority- Organization, Responsibilities, Certificate of Pharmaceutical Product COPP, Regulatory requirements and approval procedures for New Drugs. Quality management systems- Quality management and Certifications- Concept of Quality, Total Quality Management, Quality by Design QbD, Six Sigma concept, Out of Specifications OOS, Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP Indian Regulatory Requirements- Central Drug Standard Control Organization CDSCO and State Licensing Authority- Organization, Responsibilities, Certificate of Pharmaceutical Product COPP, Regulatory requirements and approval procedures for New Drugs.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical Science: The Science and Practice of Pharmacy	JP Remington, AR Gennaro	Lippincott Williams and Wilkins	2000
2	New drug approval process: Accelerating Global registrations	RA Guarino	Taylor and francis	2004
3	Total Quality Management	Besterfield	Pearson Education	1995
4	Lachman/Lieberman's theory and practice of industrial pharmacy	RK Khar, SP Vyas, FJ Ahmad, GK Jain	CBS Publishers	2020
5	Modern Pharmaceutics	GS Banker, CT Rhodes	Taylor and francis	1990

PHARMACY PRACTICE THEORY (PH. PR)

COURSE CODE	22PY4135T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To understand hospital organization and its functions along with application of ADRs.	3	1,3,7
CO2	To understand various drug distribution methods, TDM and medication adherence of patients	2	1,5,7
CO3	To understand in detail about PTC, Drug information services and patient counselling	2	1,3,7
CO4	To understand and apply the activities of clinical pharmacists along with investigation of laboratory data	3	1,3,8

Syllabus

Module 1	a) Hospital and it's organization Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions. b) Hospital pharmacy and its organization Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists. c) Adverse drug reaction Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction-beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. d) Community Pharmacy Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.
Module 2	a) Drug distribution system in a hospital Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs. b) Hospital formulary Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary. c) Therapeutic drug monitoring Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring. d) Medication adherence Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence. e) Patient medication history interview Need for the patient medication history interview, medication interview forms. f) Community pharmacy management Financial, materials, staff, and infrastructure requirements.

Module 3	a) Pharmacy and therapeutic committee Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation. b) Drug information services Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information. c) Patient counseling Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist d) Education and training program in the hospital Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. e) Prescribed medication order and communication skills Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.
Module 4	a) Budget preparation and implementation Budget preparation and implementation b) Clinical Pharmacy Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern. c) Over the counter (OTC) sales Introduction and sale of over the counter, and rational use of common over the counter medications. a) Drug store management and inventory control Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure b) Investigational use of drugs Description, principles involved classification, control, identification, role of hospital pharmacist, advisory committee. c) Interpretation of Clinical Laboratory Tests Blood chemistry, hematology, and urinalysis.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	A textbook of hospital pharmacy	Merchant S.H. and Dr. J.S.Quadry	B.S. Shah Prakakshan	2001
2	A textbook of Clinical Pharmacy Practice- essential concepts and skills	Parthasarathi G, Karin Nyfort-Hansen	Orient Longman Private Limited	2004
3	Hospital pharmacy	William E. Hassan	Philadelphia Lea & Febiger	1986
4	Hospital Pharmacy	Tipnis Bajaj	Career	2008
5	Basic skills in interpreting laboratory data	Scott LT	American Society of Health System Pharmacists Inc	2009

NOVEL DRUG DELIVERY SYSTEM THEORY (NDDS)

COURSE CODE	22PY4136T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To Understand the Various approaches of controlled drug delivery system and Microspheres.	2	1, 4
CO2	To Understand the various approaches for development of Mucosal and implantable drug delivery system.	2	1, 4
CO3	To Understand the approaches and Evaluation of Transdermal, Gastro retentive and Naso pulmonary drug delivery system.	2	1, 4
CO4	To Apply the concept and approaches ocular and targeting methods such as liposomes, niosomes, and nanoparticles.	2	1, 4

Syllabus

Module 1	Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.
Module 2	Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications. Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems. Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump
Module 3	Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches. Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications. Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

Module 4	Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications. Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations andocuserts. Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Novel Drug Delivery Systems	Y W. Chien	Marcel Dekker	2008
2	Controlled Drug Delivery Systems	Robinson, J. R., Lee V. H. L	Marcel Dekker	2008
3	Controlled and Novel Drug Delivery	N.K. Jain	CBS Publishers& Distributors	2010
4	Controlled Drug Delivery	S.P. Vyas and R.K. Khar	CBS Publishers& Distributors	2015
5	Controlled and Novel Drug Delivery	Dr Madusudan rao	CBS Publishers& Distributors	2010

PRACTICE SCHOOL (PS)

COURSE CODE	22PY4137PS	MODE	R	LTPS	0-0-12-0	PRE-REQUISITE	NIL

CO#	CO Description	BTL	PO Mapping
CO1	Educational initiatives seeking to introduce industry perspective in education	1	1
CO2	To acquire learning by applying the knowledge and the skills they possess	2	2, 3
CO3	Simulation of the Industry environment into the process of education	2	4
CO4	Industrial training through experimental and cooperative learning	5	4
CO5	Promotes Partnership and intellectual exchange between academia and industry	2	6

BIO STATISTICS AND RESEARCH METHODOLOGY THEORY (BSRM)

COURSE CODE	22PY4238T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand high consciousness/realization of current issues related to health and pharmaceutical problems with in the country and worldwide.	2	1
CO2	Prioritize healthcare development.	5	1
CO3	Evaluate alternative ways of solving problems related to health and pharmaceutical issues	5	1
CO4	Design a better health care service system	5	1

Syllabus

Module 1	Introduction: Statistics, Biostatistics, Frequency distribution Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples
Module 2	Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x= a + by, Multiple regression, standard error of regression– Pharmaceutical Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way
Module 3	Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallistest, Friedman Test Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph Designing the methodology: Sample size determination and Power of a study,
Module 4	Blocking and confounding system for Two-level factorials Regression modelling: Hypothesis testing in Simple and Multiple regression models Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Biostatistics and Research methodology ,	N. K. Nag	Kalyani Publishers	2004
2	Introduction to Biostatistics and Research methodology,	Ronald	Estern Economy Edition	2013
3	Pharmaceutical statistics- Practical and clinical applications	Sanford Bolton	Marcel Dekker Inc	2013
4	Fundamental of Statistics	S.C.Gupth	Himalaya Publishing House-	2014
5	Design and Analysis of Experiments –,R	Pannerselvam,	PHILearning Private Limited	2015

SOCIAL AND PREVENTIVE PHARMACY THEORY (SPP)

COURSE CODE	22PY4239T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand current issues related to health and pharmaceutical problems within the country and worldwide.	2	8,9,10
CO2	Applying current healthcare development for a critical way of thinking.	3	8,9,10
CO3	Understanding alternative ways of solving problems related to health issues through various healthcare programs.	2	8,9,10
CO4	Understanding alternative ways of solving problems related to sanitation and hygiene	2	8,9,10

Syllabus

Module 1	Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention. Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health Hygiene and health: personal hygiene and health care; avoidable habits.
Module 2	Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse
Module 3	National health programs, its objectives, functioning and Outcomes of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme
Module 4	National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Park Textbook of Preventive and Social Medicine	K park	BANARSIDAS BHANOT PUBLISHERS	2011
2	Community pharmacy practice	Ramesh adepu	BSP publishers	2017

PHARMA MARKETING MANAGEMENT (THEORY) (PMM)

COURSE CODE	22PY4240ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	NIL

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To provide an understanding of sales and marketing of pharmaceutical products.	2	1
CO2	Know about various policies for drug inventory management	2	1
CO3	Know about retail and wholesale marketing	2	1
CO4	Understand business potential and development in product sales and manufacturing	2	1

Syllabus

Module 1	Marketing: Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior. Pharmaceutical market: Quantitative and qualitative aspects; size and composition of the market; demographic descriptions andsocio-psychological characteristics of the consumer; market segmentation& targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist
Module 2	Analysing the Market; Role of market research. Product decision: Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry. Promotion: Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products
Module 3	Pharmaceutical marketing channels: Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physicaldistribution management. Professional sales representative (PSR): Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR. Pricing: Meaning, importance, objectives, and determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry.
Module 4	An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority). Emerging concepts in marketing: Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Marketing Management	Philip Kotler and Kevin Lane Keller	Prentice Hall of India	2022
2	Marketing Management	Arun Kumar and N Menakshi	Vikas Publishing	2022
3	Pharmaceutical Marketing in India	Subba Rao Changanti	Excel Publications	2019

PHARMACEUTICAL REGULATORY SCIENCES THEORY (PRS)

COURSE CODE	22PY4241ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	NA

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Know about the process, legal aspects, quality policies of drug discovery and development and manufacturing in India	2	1
CO2	Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals	2	1
CO3	Know the regulatory approval process in India	2	1
CO4	Know about the registration of drug product in Indian and international markets	2	1

Syllabus

Module 1	**New Drug Discovery and development-** Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities,clinical studies, Innovator and generics, Concept of generics, Generic drug product development. **Clinical trials-** Developing clinical trial protocols, Institutional Review Board or Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors and Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials.
Module 2	**Regulatory Concepts-** Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book **Regulatory authorities and agencies-** Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada(Organization structure and types of applications)
Module 3	**Regulatory Approval Process:** Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application(NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA or ANDA.
Module 4	**Registration of Indian drug product in overseas market-** Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Drug Regulatory Affairs	Sachin Itkar, Dr. N.S. Vyawahare	Nirali Prakashan	2019
2	The Pharmaceutical Regulatory Process, Drugs and the Pharmaceutical Sciences Vol.185.	Ira R. Berry and Robert P. Martin	Informa Health care Publishers	2008
3	New Drug Approval Process: Accelerating Global Registrations	Richard A Guarino,	CRC Press	2013
4	FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics	Douglas J. Pisano, David Mantus	CRC Press	2003
5	Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance	Fay A. Rozovskyand Rodney K. Adams	Jossey-Bass	2003
6	Drugs: From Discovery to Approval	Rick Ng6	Wiley-Blackwell	2004

PHARMACOVIGILANCE THEORY (PV)

COURSE CODE	22PY4242ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding the monitoring aspects of Pharmacovigilance	2	1,9
CO2	Understanding the monitoring aspects of Pharmacovigilance	2	1,9
CO3	Understanding the monitoring aspects of Pharmacovigilance	2	1,9
CO4	Understanding the medical codes used in the pharmacovigilance industry	2	1,9

Syllabus

Module 1	Introduction to Pharmacovigilance: History and development of PV, Importance of safety monitoring of Medicine, WHO international drug monitoring program, Pharmacovigilance Program of India (PvPI). Introduction to ADRs, and classification of ADRs, Methods in Causality assessment, Severity and seriousness assessment, Predictability and preventability assessment, and Management of adverse drug reactions. Basic terminologies used in pharmacovigilance: Terminologies of adverse medication-related events, Regulatory terminologies, CDSCO, D&C Act and Schedule Y, Differences in Indian and global PV requirements.
Module 2	CO-II Drug and disease classification: Anatomical, therapeutic, and chemical classification of drugs. International classification of diseases, Daily defined doses, International Non-proprietary Names for drugs, Drug dictionaries and coding in pharmacovigilance, WHO adverse reaction terminologies MedDRA and Standardised Med DR Queries, WHO drug dictionary, Eudravigilance medicinal product dictionary, Information resources in pharmacovigilance, Basic drug information resources Specialised resources for ADRs, Establishing pharmacovigilance program, Contract Research Organisations (CROs), Establishing a national program. Drug safety evaluation in special populations, Paediatrics, Pregnancy and lactation, Geriatrics, CIOMS, CIOMS Working Groups, CIOMS Form
Module 3	Vaccine safety surveillance, Vaccine Pharmacovigilance, Vaccination failure, Adverse events following immunization, Passive surveillance – Spontaneous reports and case series, Stimulated reporting, Active surveillance – Sentinel sites, drug event monitoring and registries, Comparative observational studies – Cross-sectional study, case-control study and cohort study, Targeted clinical investigations, Communication in pharmacovigilance, Communication in Drug Safety Crisis management, Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media.
Module 4	Safety data generation, pre-clinical phase, Clinical phase, Post approval phase (PMS), ICH Guidelines for Pharmacovigilance, Organization and objectives of ICH, expedited reporting, Individual case safety reports, Periodic safety update reports, Post approval expedited reporting, Pharmacovigilance planning, Good clinical practice in pharmacovigilance studies, Pharmacogenomics of adverse drug reactions, Genetics

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Mann's Pharmacovigilance	Elizabeth B. Andrews, Nicholas,	Wiley Publishers.	2018
2	An Introduction to Pharmacovigilance	Patrick Waller	Wiley Publishers.	2018
3	Cobert's Manual of Drug Safety and Pharmacovigilance	Cobert's	Barton Cobert,Jones& Bartlett Publishers.	2019
4	Stephens' Detection of New Adverse Drug Reactions:	John Talbot,	Patrick Walle, Wiley Publishers.	2022
5	Practical Drug Safety from A to Z By	Barton Cobert, Pierre Biron,	Jones and Bartlett Publishers.	2021

QUALITY CONTROL AND STANDARDIZATION OF HERBALS THEORY -(QCSH)

COURSE CODE	22PY4243ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Know WHO guidelines for quality control of herbal drugs	2	1, 4
CO2	Know Quality assurance in herbal drug industry	2	1, 4
CO3	Know the regulatory approval process and their registration in Indian and international markets	2	1, 4
CO4	Appreciate EU and ICH guidelines for quality control of herbal drugs	2	1, 4

Syllabus

Module 1	Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use. **Quality assurance in herbal drug industry** of cGMP, GAP, GMP and GLP in traditional system ofmedicine
Module 2	WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal MedicinesWHO Guidelines on GACP for Medicinal Plants. EU and ICH guidelines for quality control of herbal drugs. Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines. Stability testing of herbal medicines
Module 3	Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration GMP requirements and Drugs & Cosmetics Act provisions. Regulatory requirements for herbal medicines.
Module 4	WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Textbook of Pharmacognosy	Trease &Evans.	Saunders	2009
2	Herbal drug technology	Aggrawal, S.S	Universities Press	2002
3	Pharmacognosy	Kokate, Purohit andGokhale	Nirali Prakashan	2018
4	Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals.	Mukherjee, P.W.	Business Horizons Publishers, New Delhi, India,	2002.
5	Pharmacognosy & Phytochemistry	V.D.Rangari	Career publications	2017

COMPUTER AIDED DRUG DESIGN THEORY (CADD)

COURSE CODE	22PY4244ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	NA

Course Outcomes

CO NO	Course Outcomes	BTL	PO Mapping
CO1	Design and discovery of lead molecules	6	1,4
CO2	Application of drug design in drug discovery process	3	1,4
CO3	Application of the concept of QSAR and docking	3	1,4
CO4	Understand various strategies to develop new drug like molecules.	2	1,4

Syllabus

	Topics
Module 1	**Introduction to Drug Discovery and Development:** Stages of drug discovery and development. Lead discovery and Analog Based Drug Design: Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.
Module 2	**Analog Based Drug Design:** Bioisosterism, Classification, Bioisosteric replacement. Any three casestudies. **Quantitative Structure Activity Relationship (QSAR):** SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.
Module 3	**Molecular Modeling and virtual screening techniques: Virtual Screening techniques:** Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening, **Molecular docking**: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.
Module 4	**Informatics & Methods in drug design:** Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases. **Molecular Modeling:** Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Drug Action at the Molecular Level	Robert GCK	University Prak Press Baltimore	2009
2	Quantitative Drug Design	Martin YC.	Dekke	2005
3	Text Book of Organic Medicinal & Pharmaceutical Chemistry	Delgado JN, Remers WA eds	Lippincott. NY	2003

CELL AND MOLECULAR BIOLOGY THEORY (CMB)

COURSE CODE	22PY4245ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	Course Outcomes	BTL	PO Mapping
CO1	Understanding basics and applications of cell and molecular biology	2	1
CO2	Understanding chemical foundations and cellular process	2	1
CO3	Understand of science of genetics.	2	1
CO4	Understand the principle of cell signalling	2	1,4

Syllabus

Module 1	Definitions theory and basics and Applications. Cell and Molecular Biology: History and Summation. Properties of cells and cell membrane. Prokaryotic versus Eukaryotic. Cellular Reproduction
Module 2	Chemical Foundations – an Introduction and Reactions (Types). DNA and the Flow of Molecular Information. DNA Functioning, DNA and RNA, Types of RNA, Transcription and Translation. Proteins: Defined and Amino Acids, Protein Structure, Regularities in Protein Pathways, Cellular Processes, Positive Control and significance of Protein Synthesis
Module 3	. Science of Genetics: Transgenics andGenomic Analysis, Cell Cycle analysis, Mitosis and Meiosis, Cellular Activities and Checkpoints
Module 4	CellSignals: Introduction, Receptors for Cell Signals, Signaling Pathways: Overview, Misregulation of Signaling Pathways, Protein-Kinases: Functioning.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Pharmaceutical Microbiology	W.B. Hugo and A.D. Russel.,.	Blackwell Scientific publications	2020
2	Basic and clinical pharmacology,	Katzung B. G., Masters S. B., Trevor A. J.	Lea& Febigur	2018
3	The Pharmacological Basis of Therapeutics	Goodman and Gilman's	Nirali Prakashan	2018
4	Applied Therapeutics, The Clinical use of Drugs, The Point	Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W.		2016
5	Tutorial Pharmacy	Cooper and Gunn's		2018

COSMETIC SCIENCE THEORY (CS)

COURSE CODE	22PY4246ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Principles of formulation and building blocks of skin careproducts	3	1
CO2	Principles of formulation and building blocks of Hair care Products	3	1
CO3	Principle of formulation of oral care products and Role of herbs in cosmetics	3	1
CO4	Principles of Cosmetic Evaluation	3	1

Syllabus

Module 1	Classification of cosmetic and cosmeceutical products. Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs. Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application. Skin: Basic structure and function of skin, Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of Cosmecuticals. Antiperspirants & deodorants- Actives & mechanism of action.
Module 2	Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para- phylene diamine-based hair dye.
Module 3	Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash. Sun protection, Classification of Sunscreens and SPF. Role of herbs in cosmetics: Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove.
Module 4	Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste. Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties. Soaps, and syndet bars. Evolution and skin benefits. Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic under-standing of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Cosmetic Formulation of Skin Care Products	Zoe Diana Draelos Lauren A. Thaman	Taylor & Francis group	2005
2	Poucher's Perfumes, Cosmetics and Soaps	William Arthur Poucher	Springer Nature	2019

EXPERIMENTAL PHARMACOLOGY THEORY (EP)

COURSE CODE	22PY4247T	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Discuss the applications of various commonly used laboratory animals in preclinical research	2	1,3
CO2	Understand the animal screening models for various indications	2	1,3
CO3	Understand the animal screening models for nervous system related indications	2	1,3
CO4	Understand the importance of biostatistics and research methodology in clinical and preclinical research	2	1,3,4

Syllabus

Module 1	**Laboratory Animals:** • Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals. • Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. • Techniques for collection of blood and euthanasia. • Common routes of drug administration in laboratory animals. • Dose selection, calculation and conversions, preparation of drug solution/suspensions. Grouping of animals and importance of sham negative and positive control groups
Module 2	**Study of screening animal models for various indications** • Rationale for selection of animal species and sex for the study. • Diuretics • Anti-asthmatics • Analgesic • Antipyretic • Anti-inflammatory • Drugs acting on eye • Antihypertensives • Antiarrhythmics • Anti-dyslepidemics • Anti-aggregatory • Coagulants • Anticoagulants • Antiulcer • Antidiabetic • Anticancer

Module 3	**Study of screening animal models for nervous system related indications** • Nootropics & Alzheimer's disease • Anti-Parkinson's • General anesthetics • Sedative and hypnotics • Antipsychotic • Antidepressant • Antiepileptic • Sympathomimetics • Sympatholytics • Parasympathomimetics • Parasympatholytics • Skeletal muscle relaxants • Local anesthetics
Module 4	**Research methodology and Bio-statistics** • Selection of research topic • Review of literature • Research hypothesis • Study design • Pre-clinical data analysis • Interpretation using Students 't' test and One-way ANOVA. • Graphical representation of data

Reference Books:

Sl No	Title	Author(s)	Publisher	edition
1	Fundamentals of Experimental Pharmacology	M. N. Ghosh	Hilton and Company	2008
2	Hand book of Experimental Pharmacology	S. K. Kulakarni	**VALLABH PRAKASHAN**	2014
3	CPCSEA guidelines for laboratory animal facility.		Ministry of Environment, forest,climate change government of India	2018
4	Drug discovery and Evaluation by	Vogel H.G.	Springer	1996
5	Introduction to biostatistics and research methods	PSS Sundar Rao and J Richard	**PHI Learning Pvt. Ltd.**	2012

ADVANCED INSTRUMENTATION TECHNIQUES THEORY (AIT)

COURSE CODE	22PY4248ET	MODE	Regular	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the advanced instruments used and application in drug analysis	3	2,4
CO2	Understanding and applying the chromatographic separation and analysis of drugs	3	2,4
CO3	Understanding the calibration of various analytical instruments	3	2,4
CO4	Analysis of drugs using various analytical instruments	3	2,4

Syllabus

Module 1	Nuclear Magnetic Resonance Spectroscopy Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemicalionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications
Module 2	Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.
Module 3	Calibration and validation-as per ICH and USFDA guidelines Calibration of following Instruments Electronic balance, UV- Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC.
Module 4	Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Instrumental Methods of Chemical Analysis	B.KSharma	Krishna's Educational publishers, 30th Edition	2014
2	Organic spectroscopy	YR Sharma	S Chand lmt	2013
3	Organic Chemistry by I.L. Finar	I.L. Finar	Pearson	1973
4	Vogel's Textbook of Quantitative Chemical Analysis	AI Vogel	Pearson	2009
5	Text book of Pharmaceutical Analysis	Kenneth and Corners	Wiley	2007

DIETARY SUPPLEMENTS AND NUTRACEUTICALS THEORY (DSN)

COURSE CODE	22PY4249ET	MODE	R	LTPS	3-1-0-0	PRE-REQUISITE	Nil

Course Outcomes

CO	CO Description	BTL	PO Mapping
CO1	Understand the need of supplements by the different group of people to maintain healthy life.	2	1
CO2	Understand the outcome of deficiencies in dietary supplements.	2	1
CO3	Appreciate the components in dietary supplements and the application.	2	1
CO4	Appreciate the regulatory and commercial aspects of dietary supplements including health claims.	2	1

Syllabus

Module 1	Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds
Module 2	Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following: Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin; Sulfides: Diallyl sulfides, Allyl trisulfide; Polyphenolics: Reservetrol; Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones; Prebiotics / Probiotics.: Fructo oligosaccharides, Lactobacillum; Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans; Tocopherols; Proteins, vitamins, minerals,cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, teaand the like. Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets.
Module 3	Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids. Dietary fibres andcomplex carbohydrates as functional food ingredients. Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
Module 4	Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α- Lipoic acid, melatonin. Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole. Functional foods for chronic disease prevention. Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals. Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods. Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

Reference Books:

S. No	Title	Author(s)	Publisher	Year
1	Dietetics	Sri Lakshmi	BS Publication.	2019
2	Role of dietary fibres and neutraceuticals in preventing diseases	K.T Agusti and P. Faizal	Thomas Nelson Inc	2019
3	The Food Pharmacy	Jean Carper,	Simon & Schuster, UK Ltd.,	2000
4	Prescription for Nutritional Healing	James F.Balch and Phyllis A.Balch	Avery Publishing Group, NY	1997

PRODUCTION PROCESS FOR API/BULK DRUG/INTERMEDIATES (PPA)

COURSE CODE	22PY3123S	MODE	Regular	LTPS	0-0-0-3	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Apply the knowledge of fundamental science in API Production, understanding the role of API in pharmaceutical manufacturing and particle size in formulation	4	1
	Perform unit process oxidation, reduction, hydrogenation, sulfonation, nitration, and halogenation, catalysis, and bio-catalysis in industrial production.		
CO2	Perform downstream process of filtration, centrifugation, extraction, evaporation, crystallization, drying and size reduction	4	1
	Perform cleaning of reactor, receiver, condenser, and other API manufacturing plant components		

Syllabus

Module 1	1. Apply the fundamental science in API production including size separation, mixing and homogenization process, mass transfer, fluid flow, heat transfer and size reduction 2. Explain role of API in typical pharmaceutical manufacturing and role of API particle size in formulations 3. Determine the particle size of powders by sieve analysis and by optical microscope 4. Perform unit process of oxidation, reduction, hydrogenation 5. Perform unit process of sulfonation, nitration, and halogenation
Module 2	6. Produce bulk organic chemicals as building blocks for manufacture of drugs and drug intermediates 7. Perform catalysis and bio- catalysis in industrial production. 8. Perform downstream process of filtration, centrifugation, extraction, evaporation, crystallization, drying and size reduction 9. Perform cleaning of reactor, receiver, condenser, and other API manufacturing plant components 10. Operation of centrifuge and its application in pharmacy.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Unit operation of chemical engineering	Warren McCabe and Julian Smith	McGraw-Hill	2017
2	Pharmaceutical engineering principles and practices	C.V.S Subrahmanyam	Vallabh Prakashan	2002
3	Remington practice of pharmacy	Joseph Price Remington	Lippincott Williams & Wilkin	2006
4	Theory and practice of industrial pharmacy	Roop K. Khar, S. P. Vyas, Farhan J.. Ahmad	CBS Publishers & Distributors	2015
5	Physical pharmaceutics	K Sambamurthy	New Age International (P) Limited	2007
6	Pharmaceutics- The science of dosage form design	Michael E. Aulton	Churchill Livingstone	1988

OPERATION OF ANALYTICAL INSTRUMENTS PRACTICAL (OAI)

COURSE CODE	22PY4133S	MODE	R	LTPS	0-0-0-4	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Operation of analytical instruments used in life sciences sector	4	2
CO2	Operation of analytical instruments used in life sciences sector and in pharmacy industry	4	2

Syllabus

Module 1	Principles of analytical instruments used in life sciences sector. Applications of each analytical instrument Operation of pH meter, conductivity meter, hardness tester as per SOP Operation of analytical weighing balance as per SOP Operation of moisture analyser, disintegration tester, loss on drying (LOD) machine, dissolution apparatus, Karl Fisher (KF)apparatus, viscometer, density tester, refractometer, polarimeter, auto titrator, torque tester, leak test apparatus, pycnometer, tensile strength tester
Module 2	Operation and maintenance of centrifuge, autoclave, thin layer chromatography (TLC)chamber, hot air oven, muffle furnace Operate and maintain high performance liquid chromatography (HPLC) instrument. Operation of infrared Fourier-transform infrared (FT-IR) spectrometer Operation of Ultraviolet and visible (UV-Vis) analyser Operation of gas chromatography (GC)instrument Calibration and validation of analytical instrument as per SOP and manual Perform maintenance procedure for analytical instruments as per SOP

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text Book of Medicinal Chemistry	S. N. Pandeya & S. K. Pandey	KG Publications	2020
2	Text Book of Medicinal Chemistry	Ashutoskar	New Age International Publishers	2020
3	Organic Medicinal and Pharmaceutical Chemistry	Wilson & Giswold's	Wolters Kluwer	2022
4	Principles of Medicinal Chemistry	Foye	Wolters Kluwer	2022
5	Medicinal Chemistry	Burger's	Wiley Publications	2018

Project

PROJECT WORK (PW)

COURSE CODE	22PY4250PW	MODE	R	LTPS	0-0-12-0	PRE-REQUISITE	Nil

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Application of Pharmacy in clinical settings	3	7
CO2	Application of modern tools usage	3	3
CO3	Application of pharmacy knowledge in communication skills and ethics	3	6, 8
CO4	Application of Pharmacy knowledge in research development	3	4

Evaluation Components:

Evaluation	Component	Weightage	Total
End-Sem Formative	End Semester Exam	150	150