DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

STUDENT HAND BOOK

2016-2017

K L University
u/s 3 of UGC Act, 1956
Koneru Lakshmaiah Education Foundation

ACADEMIC REGULATIONS FOR B.TECH. PROGRAM (2015 – 16)

This document supplements the University's rules and regulations to provide assistance to all B.Tech students. It is required that every individual has to abide by these regulations.

1.0 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. 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.

Audited Course: It is a course of study which neither has evaluation component nor a grade.

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F).

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

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

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

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

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 other.

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 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.

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

Curriculum : Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Degree : A student who fulfills 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 marks in continuous in-semester evaluation and /or minimum prescribed attendance in a course shall be detained in that particular course.

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.

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

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

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.

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.

Honors Degree

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

Humanities Elective : A course offered in the area of Liberal Arts.

Industrial Training : Training program undergone by the student as per the academic requirement in any company/firm. It is a credited course.

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.

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

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

Mini project : Mini Project is a credit-based course that a student has to undergo during his/her academic term, which involves the student to explore in a discipline belonging to their research interest within their program area.

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

Multi- Section Course : Course taught for more than one section.

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

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

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 a 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.

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

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

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

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.

Project based laboratory : Project Based Laboratory is a student-centric learning methodology that involve students in design, problem-solving, decision making, and investigative activities; gives students the opportunity to work in teams, over extended periods of time; and culminate in realistic products or presentations

Re-Appearing : 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-Registering : A student desiring to repeat a course is permitted to do so, subject to the regulations contained herein.

Semester : It is a period of study consisting of 15 to 18 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.

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

Summer term : The term during which courses are offered from May to July. Summer term is not a student right and will be offered at the discretion of the University.
Term Paper : A 'term paper' is a research report written by students that evolves their course based knowledge, accounting for a grade. Term paper is a written original research work discussing a topic in detail. It is a credit based course.
Under-loading : Registering for lesser number of credits than normally prescribed by the Program in a semester.
Withdraw from a Course : Withdrawing from a Course means that a student can drop from a course within the first two weeks of the odd or even Semester (deadlines are different for summer sessions). However s/he can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

2.0 B.Tech. ENGINEERING PROGRAMS ON OFFER

Bachelor of Technology in Electronics and Computer Engineering (ECM)

2.1 B. Tech Programs

The students are admitted into 4- year full time B. Tech Programs as enlisted in this section. However these academic regulations provide various flexibilities in earning a) Honors b) Specialization and c) Minor Degrees listed out in the succeeding sections.

The student is awarded a B.Tech. degree provided s/he

a) Must successfully earn minimum of 157-170 credits, as stipulated in the program structure.
b) Must successfully complete a minimum of five (5) Professional Elective Courses, out of which three (3) must be from 3 different specialization areas offered by the program. However, in case of the program offering less than 3 specialization areas, s/he can complete more than one professional elective course from each of the specialization area but must ensure that s/he has completed a minimum of one course from each specialization area offered by the program.
c) Must successfully complete two (2) open electives courses
d) Must successfully undertake specific trainings in focused areas that enable students to be successful in their chosen career tracks. The focused areas are: (a) Employment in MNCs, (b) Civil Services (c) Higher Studies (d) Research and (e) Entrepreneurship.
e) Must successfully complete three (3) certificate courses (four (4) in case of CSE students) in discipline domain areas, in addition to one from yoga / sports & games / fine arts.
f) Must successfully complete the term paper and Minor Project.
g) Must successfully complete the industrial training (internship) of four weeks duration.
h) Must successfully complete Major project or practice school.
i) Must have successfully taken social service activities for a minimum duration of 30 hours starting from 3rd semester onwards
j) Must have successfully obtained a minimum CGPA of 4.5 at the end of the program.
k) 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 University or debarred from the University.

2.2 B.Tech Degree with Honors

A student is eligible for B. Tech Degree with honors subject to the following.

a) S/he should have a CGPA of 8.5 or higher at the end of semester - 4.

b) S/he must pursue 5 additional courses, (covering not less than 20 credits) other than the courses required as per program, by separately registering for those courses.
c) S/he must pursue the additional courses by overloading during a semester or summer term.
d) S/he is eligible for the degree with honors only if CGPA of 8.5 or higher is maintained in each subsequent semester/term without attempting betterment after registering for Degree with Honors.
e) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, s/he will be dropped from the list of students eligible for Degree with Honors and they will receive B.Tech Degree only. However such students will receive a separate grade sheet mentioning the additional courses completed by them.

The following are the list of B.Tech(Honors) programs offered

- Bachelor of Technology (Honors) in Electronics and Computer Engineering (ECM)

2.3 B.Tech Degree with specialization

A student is eligible to receive B. Tech Degree with specialization subject to the following:

a) S/he must successfully complete five (5) professional electives courses from a single specialized area and six (6) credits are earned by the student in addition to B. Tech Degree requirements,.
b) Must have completed term paper and Minor project in the same area of specialization; but this is to be done as part of the B. Tech Degree program requirement only
c) Attain a minimum CGPA of 6.75 at the end of the Program.

Degree with specialization is offered in the following areas:

Area of Specialization	
1)	Web Technologies
2)	Wireless Sensor Networks
3)	Embedded Systems

2.4 B.Tech Degree with a Minor

A student who fulfills the B. Tech program requirements of a discipline in which s/he was admitted, is awarded a B.Tech degree in that discipline. The University also offers flexibility for a student to successfully complete five (5) additional courses (necessarily comprising of professional core courses category) from another discipline, which collectively accounts to 20 credits. Having done so s/he gets eligibility for the award of a minor degree in that discipline.

3.0 B.Tech 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 / Project/ Self Study / Capstone Design etc.), in the Choice Based Credit System. However all such are essentially designed, implemented and assessed on Outcome Based Education Framework.

4.0 Program Structure

a) B.Tech program is spread over a span of 8 semesters.
b) Each semester is of, approximately 18 weeks duration and each semester is classified as:

- Odd Semester (July – December)

- Even Semester (December/January – April/May).

c) In addition to the above mentioned semesters, the university may offer summer term during May and June.

d) All courses are offered under three categories vis-à-vis. even, odd and dual semester courses.

e) Subject to the maximum permissible limit in each course, as specified by the University from time to time, students have independence to choose courses of their own choice prescribed by the University.

f) From 3rd Semester, onwards a student can register for a maximum of 7 credited courses or 26 credits (whichever is less), this however is 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).

g) A student can choose Major Project/Practice school only during 7th or 8th semester.

4.1 Course Structure

a) Every course has a Lecture-Tutorial-Practice (L-T-P) component attached to it.

b) Based upon the LTP structure the credits are allotted to a course using the following criteria.

i. Every lecture hour is equivalent to one credit.
ii. Every Tutorial/Practice hour is equivalent to half credit.
iii. If the calculated value of credit is a fraction, it is rounded to the lower number.

4.2 Course Classification

Any course offered under B.Tech program is classified as:

a) Compulsory Courses

i. Basic Sciences
ii. Engineering Sciences
iii. Humanities
iv. Professional core

b) Elective courses:

i. Professional Elective
ii. Open elective
iii. Management elective
iv. Humanities and Social science Elective
v. Science elective.

4.3 Course Precedence:

a) Every course can have one or more of its preceding course(s) as prerequisite(s).

b) To register for a course, the student must successfully complete the course(s) earmarked as pre-requisite(s) for that course.

c) In any course if a student appears for semester end exam or is declared eligible for the same, s/he is deemed to have met the prerequisite.

d) The Dean Academics after consulting with Department concerned has the prerogative to waive the prerequisite (if it is satisfied through a test) if the student has gained sufficient proficiency to take up the course.

e) Professional electives and compulsory core courses can be chosen by the students of the respective disciplines only. However, the students of a particular discipline can register for

specialization/ discipline / interdisciplinary minor / compulsory discipline courses of other disciplines provided they have met the pre-requisite or when pre requisite is waived by Dean Academics.

f) A student is not permitted to choose an open elective, if it covers more than 30% of content already done by him in any other course that s/he registered/ completed.

g) An elective course may be offered, only if a minimum of 20 students register for the course.

4.4 Summer Term Courses

The University may offer summer term courses, as per the necessity from time to time.

a) 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 have to ensure that there is no clash in the time table. In any case, a student can register only for a maximum of 14 credits during summer term.

b) Summer course is not a right of the student and will be offered based on availability of faculty and other institute resources.

5.0 Evaluation process

A student's academic progress is examined through one or more of the following methods as decided by the Course Coordinator and duly approved by the Dean, Academic.

- Assignment
- Quiz
- Sessional
- Project Report
- Review
- Seminar
- Group Discussion
- In Class Participation / Active Learning
- Case Study Report
- Capstone Design Project
- Simulation
- Comprehensive Exam

a) The Sessional tests and the Semester-End Examinations will be conducted as per the Academic Calendar.

b) As per the necessity, the Supplementary examinations will be conducted at the discretion of Vice Chancellor.

c) Students may have to take more than one examination in a day either during Semester End Examinations /Supplementary examination.

5.1 In-Semester Evaluation

a) The process of evaluation should be continuous throughout the semester and involves components as listed in section 5.0.

b) The maximum distribution of marks for In-Semester evaluation must not exceed 50% of aggregate marks of the course.

c) The distribution of weightage for various evaluation components will be decided and notified by the course coordinator through the course handout after approval by the Dean Academic, at the beginning of the semester.

d) In order to maintain transparency in evaluation, answer scripts will be 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.
e) The solution key and scheme of evaluation for all examinations will be displayed in the appropriate web portal of the course, within 2 days after the conduct of examination, by the course coordinator.
f) No correction is permitted once the course coordinator submits the marks/grades to the Controller of Examination.
g) In case the student is unable to appear for any such examination owing to medical grounds, participation in extra/ co curricular activities representing University/ state/ country; make up examination may be conducted as per the discretion of the Director / Principal of concerned College/ school.

5.1.1 Attendance Policy:

In every course, student has to maintain a minimum of 75% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 65% to 75% in every course, subjected to submission of medical certificates, medical case file and other needful documents to the concerned departments. However in case of a student having less than 65% attendance in any course, S/He shall be detained in the course and in no case such process will be relaxed.

There are no specific marks attached to attendance as such, however if the course coordinator of a course desires to award certain marks, for attendance in a course She/He can do so based on following guidelines, which thereby must be clearly reflected in respective course handouts, well before the commencement of the course work for such courses, which must be duly approved by the Dean Academic: For any course, not more than 5% marks can be allotted for attendance.

The distribution of marks is as follows:

95 to 100%	:	5 marks
90 to 95%	:	4 marks
85 to 90%	:	3 marks
80 to 85%	:	2 marks
75 to 80%	:	1 marks

Below 75% (even in case of condonation "0" marks)

The marks, if allotted for attendance will have to be considered for all L-T-P components of a course cumulatively but not specifically for theory component for any course, however if the course is an elective, then the marks are for only theory owing to the L-T-P structure for such course being "X"-0-0.

5.2 Detention policy

a) In any course, a student has to maintain a minimum of 75% attendance and must secure a minimum of 40% marks in In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.
b) However the following are the special cases where the lack of attendance can be condoned:
    i. Up to a maximum of 10% on medical grounds, in which case the student must submit the medical certificate from any recognized medical practitioner.

ii. Up to a maximum of 10% if the student represents the University / State / Country in any Extra / Co-curricular activities.
iii. The maximum extent to which a student can be condoned is 10%, and any student with less than 65% is deemed to be detained.

5.3 Semester end examination

a) The minimum weightage for Semester End Examination is 50% of the aggregate marks in the ratio of credits allotted for Lecture (L) +Tutorial (T) to Practical (P).
b) The pattern and duration of such examination will be decided and notified by the Course Coordinator through the Course handout, after approval from the Dean Academic.
c) In order to maintain transparency in evaluation, answer scripts will be shown to the students for verification upon request. If there is any discrepancy in evaluation, the student can request the course coordinator to re-evaluate.

5.4 Reports/Grades

5.4.1. Grading Process

a) At the end of all evaluation components based on the performance of the student, each student is awarded based on ***absolute grading system***. The list of absolute grades and its connotation are given below:

GRADE	GRADE POINTS	**RANGE**	
O (Outstanding)	10	85	100
A+(Excellent)	9	80	<85
A(Very Good)	8	65	<80
B+(Good)	7	60	<65
B(Above Average)	6	50	<60
C(Average)	5	45	<50
P (Pass)	4	40	<45
F(Fail)	0	<40	-
Ab (Absent)	0	-	-

b) 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.

i.e SGPA (S_i) = $\sum(C_i \times G_i) / \sum C_i$

where *'C_i'* is the number of credits of the i^{th} course and *'G_i'* is the grade point scored by the student in the i^{th} course.

c) The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a program,

i.e. CGPA = $\sum(C_i \times S_i) / \sum C_i$

where 'S'_i is the SGPA of the i^{th} semester and *'C_i'* is the total number of credits in that semester.

d) The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
e) CGPA can be converted to percentage of marks : 10 X CGPA - 7.5
f) A student get in less than 40% of overall score and 40% in the semester end examination will be considered to have earned "F" grade. Combined Theory and Lab courses the student should get independently 40% in both theory and lab components else treated as failed in

both. A student who obtains 'F' grade has to reappear for all the components of Semester End examination.

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

5.5 Betterment

a) A student may reappear for semester end examination only in the theory part of the course for improving the grade, subject to the condition that, her/his CGPA is ≤ 6.75. In the case of reappearing, the grade obtained in reappearance or the earlier grade whichever is better will be considered.
b) A Student can re-register in any course at any time before the completion of his/her program provided the University permits.
c) A student cannot reappear for semester end examination in courses like Industrial Training, courses with their L-T-P Structure 0-0-X, Minor Project, Major Project, Practice School and Term Paper.
d) The student ceases to be eligible for award of B.Tech. degree with Honors, B.Tech degree with First class and distinction, in case s/he takes up the betterment option.

6.0 REGISTRATION PROCESS

For every course, the student has to undertake the registration process prior to commencement of the course-work, based on the following conditions;

a) Registration into a course will be permitted only for such courses, which are offered by the program in that particular semester.
b) In case a course has pre-requisites, all of them must be fulfilled.
c) The University has the right to refuse registration process if a student does not turn up on the day of registration.
d) Registration shall not be permitted after the fifth working day from the scheduled date of commencement of classes.
e) Students can register for a maximum of 26 credits in a semester of their choice to meet their program requirements.
f) In case of students, who wish to register for more credits through Overloading or less credits through Under-loading, have to seek prior permission from Dean-Academic.
g) Students, who have opted for minor degree, Honors program or degree with specialisation, can register for more number of credits in a Semester through Overloading.
h) The University reserves the right to withdraw any elective course offered within one week of the commencement of the semester if sufficient numbers of students have not registered or for any other 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.
i) The University reserves the right to cancel the registration of a student from a course or a semester or debar from the degree on disciplinary grounds.
j) Within one week of the commencement of the semester, a student is permitted to substitute an elective course subject to availability with prior approval from Dean-Academic. However, a student is not permitted to withdraw from compulsory course and substitute the same with an elective course.

k) A student is solely responsible to ensure that all conditions for proper registration are satisfied, and there are no timetable clashes. The registration may be cancelled for a course or the entire semester either by the student or by the University if any irregularity is found at a later stage.

7.0 CHANGE OF BRANCH

A student admitted to a particular Branch of the B.Tech program will normally continue studying in that branch until the completion of the program. However, in special cases the University may permit a student to change from one branch to another after the second semester, provided s/he has fulfilled admission requirement for the branch into which the change is requested.

The rules governing change of branch are as listed below:

a) Top 1% (based on CGPA until 2nd semester) students will be permitted to change to any branch of their choice.
b) Apart from students mentioned in clause (a) above, those who have successfully completed all the first and second semester courses and with CGPA ≥ 8 are also eligible to apply, but the change of Branch in such case is purely at the discretion of the University.
c) All changes of Branch will be effective from third semester. Change of branch shall not be permitted thereafter.
d) Change of branch once made will be final and binding on the student. No student will be permitted, under any circumstances, to refuse the change of branch offered.

8.0 CREDIT TRANSFER

a) Credit transfer from other University to K L University or vice versa is permitted only for under graduate program.
b) Credit transfer from K L University to other University: Student studying in K L University can take transfer to another University under the following conditions:
    i. K L University has signed MOU with the University.
    ii. However, a student, after seeking transfer from K L University can return to K L University after a semester or year. Based on courses done in the other University, equivalent credits shall be awarded to such students.
c) Credit transfer from another University to KL University: A student studying in another University can take transfer to K L University under the following conditions:
    i. When a student seeks transfer, equivalent credits will be assigned to the student based on the courses studied by the student.
    ii. The student, when transferred from other Universities, has to stick to the rules and regulations of K L University.
    iii. To graduate from K L University, a student must study at least half of the minimum duration prescribed for a program at KLU.

9.0 ACADEMIC COUNSELING BOARD (ACB)

Academic Counseling Board is constituted by the Dean, Academic, for each program separately. This board shall comprise of the Chairman, Board of Studies, of the relevant program, two (2) Professors and two (2) Associate Professors.

A student will be put under Academic Counseling Board in the following circumstances:

(i) Has CGPA of less than 6.00.
(ii) Has ‘F’ grade in multiple courses.

The students under Academic Counseling Board may not be allowed to register for all regular courses in the semester, based on the recommendation of Academic Counseling Board and decision of Dean, Academic.

10.0 BACKLOG COURSES

A course is considered to be a backlog if the student has obtained 'F' grade in the course; the student has to re-appear for all components of semester end examinations in that course. However, student must successfully complete such a course in a maximum of four (4) consecutive attempts, failing which s/he must re-register for that course or a substitute course. The decision for substitute course shall be obtained from the Dean, Academic, based on the recommendations of the Board of Studies.

11.0 RUSTICATION

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

12.0 AWARD OF DEGREES

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

1) CGPA between 4.5 to 5.5 will be awarded Pass class
2) CGPA < 6.75 will be awarded second class
3) CGPA ≥ 6.75 will be awarded first class
4) CGPA ≥ 7.5 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 in four (4) years duration.

13.0 AWARD OF MEDALS

University awards Gold and silver medals to the top two (2) students based on CGPA. However,

1. the grade obtained by betterment, will not be considered for this award.
2. s/he must have obtained first class with distinction for the award of Gold or silver medal.

Any of the above rules can be altered at the discretion of the Vice Chancellor in special situations.

VISION AND MISSION STATEMENTS

UNIVERSITY

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.

DEPARTMENT

VISION

To promote innovation centric education and perform cutting edge research in interdisciplinary and multidisciplinary areas**.**

MISSION

To impart **value-based, state-of-art education** and motivate the students to become **socially committed professionals** for **overall development** of students

M1: Impart Value –Based Education

M2: Impart State of the art –education

M3: Motivate Students to become Socially Committed Professionals

M4: Overall Development of Students

PROGRAM EDUCATIONAL OBJECTIVES (PEOS) :

PEO1: Practice engineering in a broad range of industrial, societal and real world applications.

PEO2: Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.

PEO3: Conduct themselves in a responsible, professional, and ethical manner.

PEO4: Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

PROGRAM OUTCOMES(PO's)

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) an ability to function on multidisciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PROGRAM SPECIFIC OUTCOMES(PSO's)

PSO1	An ability to solve Electronics Engineering problems, using latest hardware and software tools, to arrive cost effective and appropriate solutions in the domain of embedded systems.
PSO2	An ability to demonstrate basic knowledge of Web Technologies for development of web based applications.

PEO'S VS MISSION MAPPING

	M1	**M2**	**M3**	**M4**
PEO1	**√**	**√**		**√**

PEO2		**√**		**√**
PEO3			**√**	**√**
PEO4			**√**	**√**

STUDENT OUTCOMES (SO'S) VS PEO'S MAPPING

SO'S	PEO1	PEO2	PEO3	PEO4
a	**√**	**√**		
b	**√**	**√**		
c	**√**	**√**		
d		**√**		**√**
e	**√**	**√**		
f			**√**	**√**
g		**√**	**√**	**√**
h		**√**	**√**	**√**
i	**√**	**√**	**√**	
j	**√**	**√**	**√**	**√**
k	**√**	**√**	**√**	
PSO1	**√**	**√**	**√**	
PSO2	**√**	**√**	**√**	

COURSE VS SOS & PSO'S MAPPING

Course Code	Course Title	L-T-P	CREDITS	S NO	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i	j	k
15EM3103	EMBEDDED SYSTEMS	2-2-2	4	1	CO1	Able to analyze embedded systems, analyze and program on chip peripherals for a single purpose controller			**2**								**3**
				2	CO2	Able to interface and program different off chip peripherals and communication protocols used in embedded systems			**2**								**3**
				3	CO3	Able to understand, evaluate and select appropriate software architectures			**2**								**3**
				4	C	Able to analyze and			**2**								**3**

					O 4	design embedded systems using the features in real time operating systems.											
				5	CO 5	Able to develop a prototype for a real time embedded application using project based labs.			**2**								**3**
15 EM 2001	COMPUTER ORGANIZATION AND ARCHITECTURE	2-2-2	4	6	CO 1	Understand the functionality and design the CPU functional units - control unit, registers, the arithmetic and logic unit, the instruction execution unit, and the interconnections among these components.			**2**								**3**
				7	CO 2	Understand, analyze and design main, cache and virtual memory organizations.			**2**								**3**
				8	CO 3	Understand, analyze and design different types of I/O transfer techniques.			**2**								**3**
				9	CO 4	Understand the design issues of RISC and CISC CPUs and the design issues of pipeline architectures.			**2**								**3**
				10	CO 5	Able to Design combinational and sequential circuits using LOGISIM			**2**								**3**
15 EM 2202	PROCESSORS AND CONTROLLERS	2-2-2	4	11	CO 1	Able to understand and analyze the architectural features of CISC type of General purpose processor Intel 8086 Microprocessor.					**2**						**2**
				12	CO 2	Able to understand and analyze the architectural features of CISC type of microcontroller - Intel 8051 Microcontroller.					**2**						**2**
				13	CO	Able to understand and analyze the architectural					**2**						**2**

					3	features of RISC type of microcontroller – PIC Microcontroller.												
				14	CO4	Able to program 8086 microprocessor, 8051 and PIC microcontrollers in assembly language using TASM, KEIL, MPLAB and Proteus tools.					**2**							**2**
				15	CO5	Able to Develop a real time application using 8051 & PIC Microcontrollers through project based labs.					**2**							**2**
15EM3104	COMMUNICATION SYSTEMS	2-2-2	4	16	CO1	To Understand the basics of Modulation and demodulation techniques, Different types of filtering techniques and Radio Receiver characteristics.		**2**										**2**
				17	CO2	To Understand the sampling techniques and signal to noise ratio of different pulse modulation schemes.		**2**										**2**
				18	CO3	To Design the Digital Modulation schemes, bandwidth estimation and clock recovery.		**2**										**2**
				19	CO4	To Understand the source coding techniques and estimate the error detection and correction of different block codes		**2**										**2**
				20	CO5	Able to design receivers used for Digital communication system using project based labs		**2**										**2**
15EM310	INTERNET PROG	2-2-2	4	21	CO1	Able to create Static Web pages using basic HTML & apply CSS					**2**							**3**

5	RAM MING			22	CO 2	Able to apply javascript features for form validations and event handling					**2**						**3**
				23	CO 3	Able to create databases using MYSQL and apply JDBC concepts to connect to a database.					**2**						**3**
				24	CO 4	Able to create dynamic web pages using servlets & JSP					**2**						**3**
				25	CO 5	Must be able to design WEB site considering the user interface, navigation and interaction with database using project based LABS					**2**						**3**
15 EM 320 6	VLSI DESI GN	2-2-2	4	26	CO 1	To understand the VLSI fabrication process and to be able to interact with integrated circuit process engineers		**2**									**3**
				27	CO 2	Able to analyze Circuit Charactersation ,Performance Estimation and Fault Testing.		**2**									**3**
				28	CO 3	Able to Understand Full-custom & Semi Custom design methodologies to design different PLD architectures.		**2**									**3**
				29	CO 4	Analyze different CPLD and FPGA architectures		**2**									**3**
				30	CO 5	Able to design and simulate digital circuits using Verilog HDL through project based LAbs		**2**									**3**
15 EM 325 1	ADV ANCE D EMBE	3-0-0	3	31	CO 1	Able to understand and analyze the 3 and 5 stage pipelines of ARM and able to program the							**2**				**1**

	DDED PROCESSOR ARCHITECTURES					ARM processor.											
				32	CO2	Able to program the on chip & off chip peripherals of ARM 7 controller.							**2**			**1**
				33	CO3	Understand and analyze the AMBA bus architecture and different advanced ARM cores.							**2**			**1**
				34	CO4	Able to analyze the different SOC applications using ARM cores.							**2**			**1**
15EM4157	HARDWARE SOFTWARE CO-DESIGN	3-0-0	3	35	CO1	Understand and Analyze the co-design models like FSM, DFG and target architectures and use the tools required for designing the hardware and software models								**2**		**1**
				36	CO2	Analyze Validation and Verification Techniques, design specification for embedded processor architectures								**2**		**1**
				37	CO3	Analyze the compilation techniques and tools for embedded processor architectures								**2**		**1**
				38	CO4	Understand the standard design methods like COSYMA system and LYCOS systems.								**2**		**1**
15EM3252	SENSORS AND SENSING PRINCIPLES	3-0-0	3	39	CO1	Able to understand and analyze the sensor fundamentals, principles and characteristics								**2**	**2**	
				40	CO2	Understand the application of various physical and Chemical sensors								**2**	**2**	
				41	CO3	Understand the application of various optical sensors								**2**	**2**	

				42	CO4	Able to understand the different bio sensors and its limitations.									**2**	**2**		
15EM4158	WIRELESS COMMUNICATIONS & NETWORKS	3-0-0	3	43	CO1	Able to understand Transmission fundamentals and communications networks and application protocol architecture									**2**	**2**		
				44	CO2	Able to understand and analyze signal encoding techniques, spectrum and different wireless networks									**2**	**2**		
				45	CO3	Able to understand and analyze various principles of cellular wireless networks									**2**	**2**		
				46	CO4	Able to understand wireless protocols and applications of IEEE802.11 architecture and standards									**2**	**2**		
15EM4159	WIRELESS SENSOR NETWORKS	3-0-0	3	47	CO1	Able to understand Cellular and adhoc networks in detail									**2**		**2**	
				48	CO2	Able to understand wireless sensor networks data communications to other networks which involves its design and principles									**2**		**2**	
				49	CO3	Able to understand various MAC protocols for sensor networks									**2**		**2**	
				50	CO4	Able to understand and analyze various routing techniques of wsn and ad hoc networks									**2**		**2**	
15EM4160	SENSOR NETWORKS	3-0-0	3	51	CO1	Able to understand fundamentals of TinyOS and nesC in wsn environment.									**2**		**1**	
				52	C	Able to understand real									**2**		**1**	

	PROGRAMMING				O2	world programming of wireless sensor network in different scenarios.														
				53	CO3	Able to understand the performance analysis of power-aware algorithms												**2**		**1**
				54	CO4	Able to understand and develop energy efficient algorithms for wireless sensor networks thru simulation or real time experiments												**2**		**1**
15EM4163	ENTERPRISE PROGRAMMING	3-0-0	3	55	CO1	Must acquire theoretical knowledge related to enterprise architectures, development platforms, Application servers, EJB components, EJB query language.												**2**	**2**	**1**
				56	CO2	Must be hands-on developing EJB components using NETBEANS and deploy the components using JBOSS												**2**	**2**	**1**
				57	CO3	Able to understand EJB QL & develop sample applications												**2**	**2**	**1**
				58	CO4	Must develop real life Enterprise wide application based on EJB and JBOSS and SQL server as DBMS engine												**2**	**2**	**1**
15GN1001	ECOLOGY AND ENVIRONMENT	2-0-0	2	59	CO1	Understand the importance of Environmental education and conservation of natural resources.											**1, 2**	**1**		
				60	CO2	Understand the importance of ecosystems and biodiversity.											**1, 2**	**1**		
				61	CO	Apply the environmental science											**1,**	**1**		

					3	knowledge on solid waste management, disaster management and EIA process.							**3**					
15 GN 100 2	HUM AN VALU ES	2-0-0	2	62	CO 1	Understand and identify the basic aspiration of human beings						**1, 2**						
				63	CO 2	Envisage the roadmap to fulfill the basic aspiration of human beings.						**1, 2**						
				64	CO 3	Analyze the profession and his role in this existence.						**1, 2**						
15 EN 110 1	RUDI MEN TS OF COM MUNI CATI ON SKIL LS	0-0-4	2	65	CO 1	Remember speech sounds and apply stress and intonation rules to enhance pronunciation skills.							**1**					
				66	CO 2	Understand writing strategies and apply those by using the basic and advanced concepts of grammar.							**1**					
				67	CO 3	Understand the types of texts and tone of the author.							**1**					
				68	CO 4	Understand the importance of interpersonal skills							**1**					
15 EN 120 2	INTE RPER SONA L COM MUNI CATI ON SKIL LS	0-0-4	2	69	CO 1	Understand the method of identifying the meaning of words from the context and form sentences using words.							**2**					
				70	CO 2	Understand and analyze seven types of reading techniques and improve reading speed.							**2**					
				71	CO 3	Understand and apply writing strategies for office/ formal communication.							**2**					
				72	C	Understand and analyze					**1**							

					O 4	different cultures and the importance of empathy in cross-cultural communication.											
15 EN 2103	PROFESSIONAL COMMUNICATION SKILLS	0-0-4	2	73	CO 1	Understand the concept of Group Discussion and listen and speak effectively during the discussion.						**1**					
				74	CO 2	Understand and improve learners' competency in competitive English and apply the principles of grammar in real life contexts.						**2**					
				75	CO 3	Understand skimming & scanning, and apply the types of reasoning in comprehending the information.						**3**					
				76	CO 4	Understand the mechanics and application of presentation skills.					**1**						
15 EN 2204	EMPLOYABILITY SKILLS	0-0-4	2	77	CO 1	Analyze one's own strength as a speaker/ Communicator and use discretion while listening.						**2**					
				78	CO 2	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, resume and minutes of the meeting.						**3**					
				79	CO 3	Understand the organization of the passage and also analyze the tone, attitude and style of the author.						**2**					
				80	CO 4	Acquire knowledge of and apply people skills in various social organizational and corporate ambiences.					**2**						

15 EN 3105	VERBAL AND QUANTITATIVE REASONING	0-0-4	2	81	CO 1	Understand the method of identifying synonyms and antonyms and analyze the meaning of a word from the context.									**1**		
				82	CO 2	Analyze issues and arguments in the process of critical reasoning and apply grammar rules to correct sentences.									**1**		
				83	CO 3	Apply the Concepts of basic Algebra and their importance while solving the problems									**1**		
				84	CO 4	Apply the short-cut methods on the concepts of different models in Calendars, Clocks, Blood relations and various types of arrangements.									**1**		
15 MT 2005	PROBABILITY AND STOCHASTIC MODELS	2-2-2	4	85	1	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance					**2**						
				86	2	Predict the relationship between two variables and construct the linear and non-linear regression lines for the given data					**2**						
				87	3	Model the Single and multi server markovian queuing models with finite and infinite capacity.					**2**						
				88	4	Verify and validate the simulation models.											**2**
				89	5	Verify the solution of problems through MATLAB/MINITAB.											**2**
15 MT	SINGLE	2-2-2	4	90	CO	Formulate physical laws and relations					**1**						

1001	VARIABLE CALCULUS AND MATRIX ALGEBRA				-1	mathematically in the form of first order differential equations and identify a method for solving and interpreting the results.													
				91	CO-2	Formulate physical laws and relations mathematically in the form of second/higher order differential equations and identify a method for solving and interpreting the results.					**1**								
				92	CO-3	Provide solutions for Fourier series of periodic/non-periodic phenomenon in models involving differential equations.					**1**								
				93	CO-4	Apply numeric solution methods for a system of linear algebraic equations and application oriented matrix eigenvalue problems.					**1**								
				94	CO-5	Verify the solution of problems through MATLAB.													**1**
15MT1203	MULTIVARIATE CALCULUS	2-2-2	4	95	CO1	Determine the maximum and minimum values for the function involving two variables					**2**								
				96	CO2	Calculate the length of the arc, area, volume of the surface of a solid revolution					**2**								
				97	CO3	Model the given phenomena as a partial differential equations of first and second orders													**2**
				98	CO	Solve the partial differential equations by analytical and finite					**2**								

					4	difference methods											
				99	CO 5	Verify the solution of problems through MATLAB.											**2**
15MT2104	PROBABILITY AND OPTIMIZATION TECHNIQUES	2-2-2	4	100	1	To apply the basic rules of theorems of probability theory to determine the probabilities that help to solve the problems of engineering problems and to determine the expectation and variance of a random variable from its distributions.	**2**				**2**						
				101	2	To appropriately choose, define and / or to derive probabibility distributions such as the Binomial, Poisson and normal etc. to model and solve engineering problems	**2**				**2**						
				102	3	To understand how regression analysis can be used to develop an equation that estimate how two variables are related and how the analysis of variance procedure can be used to determine it means of two papulation are equal	**2**				**2**						
				103	4	To have through knowledge on linear and non linear programming	**2**				**2**						
				104													
15ME1001	MECHANICS	2-2-2	4	105	CO 1	Apply the concept of forces, governing static equations and analyze planer system of forces. Apply different analytical methods on spatial system of forces and analyzing them	**2**										

				106	CO 2	Understanding the concepts of planar and non-planar system of parallel forces and analyzing them. estimate moment of inertia of lamina and material bodies	**2**											
				107	CO 3	Analyzing the rigid bodies under translation and rotation with and without considering forces.					**1**							
				108	CO 4	Understanding the engineering mechanics physical systems prepare and demonstrate the models with the help of mechanics concepts to solve the engineering problems					**1**							
				109	CO 5	Apply the concepts of mechanics and carryout different experiments and analyze the results		**2**										
15 PH 100 1	ENGINEERING MATERIALS	2-2-2	4	110	CO 1	Understand the concepts of crystallography and crystalline imperfections in order to determine crystal structures and to identify defects in crystals			**1**									
				111	CO 2	Understand electrical and optical properties of materials and apply them to know various mechanisms involved in electrical, electronic, optical, optoelectronic devices.			**1**									
				112	CO 3	Understand mechanical and thermal properties of materials and apprehend their importance in identification of			**1**									

						materials for specific engineering applications													
				113	CO 4	Understand magnetic properties of materials and apply them to know various mechanisms involved in magnetic memory devices and transformers.			**1**									
15 CY 1001	ENGINEERING CHEMISTRY	2-2-2	4	114	CO-1	Predict potential complications from combining various chemicals or metals in an engineering setting.			**1**									
				115	CO-2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena.			**1**									
				116	CO-3	Examine water quality and select appropriate purification technique for intended problem.			**1**									
				117	CO-4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes.				**1**								
				118	CO-5	An ability to analyze & generate experimental skills.				**1**								
15 BT 1001	BIOLOGY FOR ENGINEERS	2-0-0	2	119	CO-1	Acquire the Knowledge of basic biology							**1**		**2**			
				120	CO-2	Acquire the Knowledge of Human Biological Systems							**1**		**2**			
				121	CO-3	Acquire Knowledge on Microorganisms and Biosensors							**1**		**2**			
15	FIEL	2-2-	4	122	1	Understand the circuit	**1**											**1**

EE 1201	DS & NETWORKS	2				elements, kirchhoff's law and theorems to solve the networks													
				123	2	Apply the procedure to determine form factor and peak factor to different symmetrical & unsymmetrical waves.	**2**												
				124	3	Apply vector algebra to field fundamentals to analyze electric and magnetic field distributions	**2**												
				125	4	Apply Maxwell's equations for static and time varying fields	**2**												
				126	5	Test and Analyze the concepts learned in fields and networks by conducting experiments or by any simulation softwares	**2**												
15GN1004	INTRODUCTION TO ENGINEERING	2-2-2	4	127	CO-1	Understand the basic principles of engineering design							**1**						
				128	CO-2	Understand the aspects of critical thinking and problem solving in engineering							**2**						
				129	CO-3	Apply to knowledge of critical thinking to frame real-world problems and provide basic solution approach to such problems from engineering perspective							**2**						
				130	CO-4	Understand and analyze the possible career options in Engineering and develop strategic plan, career targets and mechanism to achieve the same.						**3**							
15	C PROG	2-4-2	5	131	CO	Illustrate how problems are solved using	**2**												

CS 1001	RAMMING & DATA STRUCTURES				-1	computers and programming.											
				132	CO-2	Interpret & Illustrate user defined C functions and different operations on list of data.	**2**										
				133	CO-3	Implement Linear Data Structures and compare them.					**2**						
				134	CO-4	Implement Binary Trees.					**2**						
				135	CO-5	Apply the knowledge obtained by the course to solve real world problems.											**2**
15ME1002	ENGINEERING GRAPHICS			136	CO-1	Draft orthographic Projections, Isometric views ,projection of planes, Manually and prepare Models in workshop by using drawings.											**2**
		0-0-6	3	137	CO-2	Draftorhtographic projections ,isometric views , projection of planes using Autocad. Draft projection of solids Manually and by using AutoCAD and prepare Models in workshop by using different workshop trades											**2**
				138	CO-3	Draft Development of surfaces of solid and sections of solid Manually											**2**
				139	CO-4	Practicing house wiring through Auto Cad											**2**
				140	CO	Develop 2D & 3D components using Auto		**2**									

					-5	Cad Software												
15GN1003	MEASUREMENTS	2-2-2	4	141	CO-1	Understand and apply the fundamentals of a measurement system, characteristics, and metrology using simulation and experimentation tools.	**2**	2										
				142	CO-2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	**2**	2										
				143	CO-3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.	**2**	2										
				144	CO-4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.	**2**	2										
				145	CO-5	Apply the theoretical concepts to measure different parameters		2										
15CS2002	OBJECT ORIENTED PROGRAMMING	2-2-2	4	146	CO1	Understand Basic Concepts of OOP, introduction to classes and objects through Java Language and apply.					**2**							
				147	CO2	Understand the concepts of constructors, Overloading, parameter passing, access control, Inheritance and apply.					**2**							
				148	CO	Understand Packages, Interfaces, and					**2**							

					3	Exception Handling and apply.												
				149	CO4	Understand I/O Streams & apply and understand Basic Concepts of Multi -Threading												**3**
				150	CO5	Apply OOP concepts for developing an application												**3**
15EC2002	SIGNAL ANALYSIS	2-2-2	4	151	CO1	Demonstrate signals and their Spectra	**2**											
				152	CO2	Analyze discrete time systems	**2**											
				153	CO3	Design filters to cater signal analysis needs												**2**
				154	CO4	Analyze non stationary signals in time												**2**
				155	CO5	Analyze non stationary signals in frequency domains												**2**
15CS2003	DISCRETE MATHEMATICS	2-2-2	4	156	CO1	Understand sets, relations, functions and discrete structures , Count discrete event occurrences	2											
				157	CO2	Apply Propositional logic and First order logic to solve problems	**2**											
				158	CO3	Formulate and solve recurrence relations, apply algebraic structures and lattices.												**2**
				159	CO4	To identify the basic properties of graphs and trees and model simple applications												**2**

				160	CO5	Relate practical examples to the appropriate set,function or relation model and interpret the associated operations and terminology in context												**2**
15CS2206	OPERATING SYSTEMS	2-2-2	4	161	CO1	Develop algorithms for subsystem components		**2**										
				162	CO2	Understand process and memory virtualization		**2**										
				163	CO3	understand persistence concepts		**2**										
				164	CO4	Design and solve synchronization problems , and multi threading libraries												**3**
				165	CO5	Develop application programs using UNIX system calls												**3**
15CS2208	COMPUTER NETWORKS	2-2-2	4	166	CO1	Understand OSI and TCP/IP models												**2**
				167	CO2	Analyze MAC layer protocols and LAN technologies					**2**							
				168	CO3	Implement routing and congestion control algorithms					**2**							**2**
				169	CO4	Understand application layer concepts					**2**							
				170	CO5	Design applications using internet protocols												**2**
15EC2206	SIGNAL PROCESSING	2-2-2	4	171	CO1	Understand various signals and model physical process using them.					**2**							
				172	CO2	Acquaint with various a transformation methods and their potential for applicability in various					**2**							

						signal analysis conditions												
				173	CO3	Demonstrate sampling and its potential applications in communications, discrete signal acquisition etc.,.					**2**							
				174	CO4	Evaluate discrete system behavior and its response to facilitate system design.					**2**							
				175	CO5	Design a low pass discrete time system to meet noise elimination like applications					**2**							**3**
				176	CO6	Analyze non stationary signals and analyze them in both time frequency domains.					**2**							**3**
15EM30B1	LINUX PROGRAMMING	3-0-0	3	177	CO1	Describe and understand the fundamental LINUX operating system and utilities	**2**				**2**							
				178	CO2	apply shell scripts in order to perform basic shell Programming and analyze the Linux file system												**2**
				179	CO3	Analyze the process concepts and create applications using and signal concepts IPC mechanisms					**3**							**3**
15EM30B2	E-COMMERCE	3-0-0	3	180	CO1	Analyze various E-Commerce Business Models and Infrastructure										**2**		
				181	CO2	Understand the Ethical, Social and Political issues in E-Commerce						**1**						
				182	CO3	Analyze Marketing communications and Internet resources for E-Commerce												**2**

SYLLABUS

HUMANITIES & SOCIAL SCIENCES

RUDIMENTS OF COMMUNICATION SKILLS

Course code: 15 EN 1101 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**

Mapping of the course outcomes with student's outcomes.

CO No	Course outcome's	Mapped SO	BTL
CO 1	Remember speech sounds and apply stress and intonation rules to enhance pronunciation skills.	g	1
CO 2	Understand writing strategies and apply those by using the basic and advanced concepts of grammar.	g	1
CO 3	Understand the types of texts and tone of the author.	g	1
CO 4	Understand the importance of interpersonal skills	g	1

Syllabus:

Speaking & listening skills - Vowels in English, Diphthongs, Consonants, Word stress, Intonation, Words in Groups - English Conversation Practice, Difference between British English and American English, Received Pronunciation and Dialects, American Spelling and American Grammar , American Pronunciation, Listen and respond, Speak and Listen, Listen and Speak.

Speaking and listening exercises from Effective Speech Richard W Clark- Speaking to persuade, listening to understand.

General writing skills - Paragraph Writing: Seven 'C's of writing , Identifying & writing Topic sentences, Linkers, Coordinates, Sequencing, Letter Writing: Formal & Informal formats- Full block, Semi block, Modified block- Types & tone of letters, content & brevity, Note Making & Note Taking.

Reading skills - Reading comprehension Practice exercises (TOEFL Level) - Reading for information, Reading for specifics - Theme, Attitude, Identifying tone.

Soft skills - Introduction to soft skills, Body Language, Postures, Gestures, Eye contact, Personality styles, Grooming, Dress code, Group discussion - Format, Do s and Don'ts, scoring method

Text book:

1. Material produced by the Dept.

References Book:

1. Mark Hancock and Sylvie Donna, "English pronunciation in use: Intermediate", 2nd edition,Cambridge publication.
2. Krishna Mohan & N P Singh, "Speaking English Effective (English) 2nd Edition", Laxmi Publications-New Delhi, (2005).
3. Mr. Gopalaswamy Ramesh et al, "The Ace of Soft Skills", Pearson publishers, (2010).
4. Richard W.Clark, "Effective speech", Glencoe Pub. Co., (1988).

INTERPERSONAL COMMUNICATION SKILLS

Course code: 15 EN 1202 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**

Mapping of Course outcomes with Student outcomes:

CO No	Course outcome's	Mapped SO	BTL
CO 1	Understand the method of identifying the meaning of words from the context and form sentences using words.	g	1
CO 2	Understand and analyze seven types of reading techniques and improve reading speed.	g	2
CO 3	Understand and apply writing strategies for office/ formal communication.	g	2
CO 4	Understand and analyze different cultures and the importance of empathy in cross-cultural communication.	d	1

Syllabus:

Speaking skills - Interactive Skills: Group Activities taken from **keep Talking by Mary Spratt; at the chalk face Oxford word skills (Units 21-50)**

Vocabulary Skills -Basic Word List (900 words), Identifying meaning from context, Antonyms and Synonyms (Level 1)

Writing skills - Inter Office Communication and Intra Office Communication - Memo Writing, Circulars, Emails -

Netiquette, Formal and Informal Formats, Clear, concise expression, Dos and Don'ts of Email writing.

Reading skills - Types of Reading - Vertical Reading, Identifying the central idea, Speed Reading, and Seven techniques to improve reading speed.

Soft skills-II (Case Studies, Vodcasts and Role Play - ICT enabled) - Cultural sensitivity, Empathy and understanding, Diversity and Acculturation

Text Books:

1. Aruna Koneru, "Professional Communication", Tata Mc Graw- Hill Publishing Company, New Delhi, (2008)t.
2. Asha Kaul, "Effective Business Communication", PHI Learning Private Limited, New Delhi, (2011).
3. Sharon J. Gerson, Steven M Gerson, "Technical Writing Process and Product" (third edition), Pearson Education, Asia.
4. Frangoise Grelle, "Developing Reading Skills: A Practical Guide to Reading Comprehension Exercises", Cambridge University Press, (1981)
5. Eric H. Glendinning, Beverly Holmström, "Study Reading: A Course in Reading Skills for Academic Purposes", Cambridge University Press, (2004)
6. Content Area Reading: Teaching and Learning in an Age of Multiple Literacies, Video-Enhanced Pearson eText, Maureen, Pearson Education (US), (2014)

PROFESSIONAL COMMUNICATION SKILLS

Course code: 15 EN 2103 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**

Mapping of Course outcomes with Student outcomes:

CO No	Course outcome's	Mapped SO	BTL
CO 1	Understand the concept of Group Discussion and listen and speak effectively during the discussion.	g	1
CO 2	Understand and improve learners' competency in competitive English and apply the principles of grammar in real life contexts.	g	2
CO 3	Understand skimming & scanning, and apply the types of reasoning in comprehending the information.	g	3
CO 4	Understand the mechanics and application of presentation skills.	f	1

Syllabus:

Speaking skills - Group Discussions (Level 1) - Format of GD as used in national level recruitment boards, Rules, ambience and normal practices, Do s and Don't s in Group Discussions, Helping to build confidence, improve on content and clarity, Practicing skills like Initiating, developing and concluding discussions

Structures and written expression (exercises) - Sentence Completion (Single blank TOEFL level), Analogies, One word substitutes, Mechanics of Grammar - Correction of Sentences, Errors in grammar and usage**,** Jumbled Sentences / Paragraph scramble, Rephrasing.

Reading skills level 2 (gre gmat cat level) - Skimming and scanning, Word Perception tests, Reading speed development (7 skill exercises), Searching for key words, Reasoning Skills - Analytical Reasoning, Critical Reasoning, Language Specific Reasoning

Soft skills III - Seminars, Presentations, Case Studies: Role Plays and Simulated Presentation.

Text Books:

1. Edgar Thorpe and Showick Thorpe, "Objective English"3rd Ed,Pearson Publishers, (2010).
2. R. S. Aggarwal, "Objective General English", S Chand Publishers, New Delhi.
3. Mortimer J. Adler, Charles Van Doren, Simon and Schuster, "How to Read a Book: The Classic Guide to Intelligent Reading" , (2014).
4. Bob Underwood, Jesse Zuck, "Philosophy Skills Book: Exercises in Philosophical Thinking, Reading, and... Chris Case", A&C Black, (2012)
5. Joanne Carlisle, "Reasoning and Reading Level 1", School Specialty Intervention, (1999)
6. Patsy Mc Carthy & Caroline Hatcher, "Presentation skills. The essential guide for students", Sage publications, (2002).

EMPLOYABILITY SKILLS

Course code: 15 EN 2204 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**
Mapping of Course outcomes with Student outcomes:

CO No	Course outcome's	Mapped SO	BTL
CO 1	Analyze one's own strength as a speaker/ Communicator and use discretion while listening.	g	2
CO 2	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, resume and minutes of the meeting.	g	3
CO 3	Understand the organization of the passage and also analyze the tone, attitude and style of the author.	g	2
CO 4	Acquire knowledge of and apply people skills in various social organizational and corporate ambiences.	f	2

Syllabus :

Speaking skills - Group Discussions Level 2 Speaking and listening exercises From Effective Speech by Richard W Clark.

Know yourself as a Communicator, Communicating with others, Group Discussion, Interactive Listening.

Writing skills- Writing Proposals, Product and process description, Agenda, Minutes and Scheduling meetings, Technical Writing Skills - Report Writing, Types of reports, Formats, How to write good reports, Résumé and Job Application.

Reading skills - Reading Comprehension (GRE, GMAT Pattern) - Identifying the author's purpose, Main Idea/ Theme, Suitable Title, Specific information, not mentioned/ Negative factual information, Tone, Attitude and Style, Structure / Organization. Vocabulary in context - Signpost words, Pejorative Signals and Complimentary Signals, Continuation Signals, Contrast signals, Sentence Completion, Text completion, Sentence Equivalence (Single blank, double blank, three blank, two answer Questions)

People skills - Initiating and ending conversations, Expressing and creating interest, practicing therapeutic listening, Breaking good/bad news.

Text Books:

1. Raymond V.Leisikar et al. , "Business Communication: Connecting in a Digital World", Tata Mc Graw Hill Education, 13th Ed., (2015)
2. Mallika Nawal, "Business Communication", Cengage Learning Pvt Limited, Delhi, (2014)
3. Lisa Zimmer Hatch, Scott Hatch, "GMAT for Dummies", John Wiley & Sons, (2012)
4. Eric H. Glendinning, Beverly Holmström, "Study Reading: A Course in Reading Skills for Academic Purposes", Cambridge University Press, (2004).
5. Sunitha Mithra, "Personality Development and soft skills", OUP (2012).

VERBAL AND QUANTITATIVE REASONING

Course code: 15 EN 3105 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**

Mapping of Course outcomes with Student outcomes:

CO. No	Course outcome's	Mapped SO	BTL
CO 1	Understand the method of identifying synonyms and antonyms and analyze the meaning of a word from the context.	i	1
CO 2	Analyze issues and arguments in the process of critical reasoning and apply grammar rules to correct sentences.	i	1
CO 3	Apply the Concepts of basic Algebra and their importance while solving the problems	i	1
CO 4	Apply the short-cut methods on the concepts of different models in Calendars, Clocks, Blood relations and various types of arrangements.	i	1

Syllabus:

Verbal ability (GRE, GMAT, CAT PATTERN): Synonyms**,** Antonyms and One word substitutes.

Critical reasoning: Analyzing issues**,** Analyzing arguments and Sentence correction.

Quantitative reasoning (GRE, GMAT, CAT pattern):Arithmetic – Decimals**,** Exponents and Roots**,** Fractions**,** Integers**,** Percent**,** Ratio**,** Real Numbers. **Algebra -** Applications**,** Coordinate Geometry**,** Functions**,** Graphs of Functions**,** Operations with Algebraic Expressions**,** Rules of Exponents**,** Solving Linear Equations**,** Solving Linear Inequalities**,** Solving Quadratic Equations.

Reasoning - Clocks, Calendars**,** Binary logic, seating arrangement**,** Blood relations**,** Logical sequence**,** Assumption**,** Premise Conclusion**,** Linear and matrix arrangement.

Text Books:

1. Hari Mohan Prasad, "Objective English for Competitive Examinations (English)" 4th Ed. Tata McGraw - Hill Education, 2009.
2. RS Agarwal, "Objective General English", S Chand Publishers, New Delhi
3. P Bhardwaj , "Analytical & Logical Reasoning For CAT & Other Management Entrance Tests", Arihant Publications(I) Pvt.Ltd – Meerut, 2012 print.
4. R. S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand, (2013).

CORPORATE COMMUNICATION SKILLS

Course code: 15 EN 3206 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**

Mapping of Course outcomes with Student outcomes:

CO. No	Course outcome's	Mapped SO	BTL
CO 1	Understand and analyze the depth of a topic and use the	g	1

	advanced levels in creative speaking and debating.		
CO 2	Understand and analyze various strategies involved in writing an essay and apply various styles in writing.	g	2
CO 3	Understand and analyze the given text critically and answer questions on critical reasoning based on the given information.	g	3
CO 4	Acquire knowledge on various employability skills & analyze a situation and develop adaptability.	f,g	3
CO5	Apply the Concepts of basic geometry and their importance while solving the problems.	g	2

Syllabus:

Speaking skills - Speaking and listening exercises, From Effective Speech Richard W Clark, Storytelling and interpretation - Speaking to Explain, Speaking Activities - JAM, Information Gap / Creating stories, Picture Description, Debate

Writing skills - Five Types of Essays (TOEFL IBT pattern) - Agree or disagree, which you prefer and why, If / imaginary, Description / Explanation, Comparison and Contrast, **Styles in Writing: Modes of Discourse -** Narration, Description, Exposition, Argumentation/ Persuasion

Reading skills - Reading Comprehension - Critical Reading, Searching for implied meanings, Answering questions on theme, tone, point of view, title etc.

Soft skills - Interview Skills**,** Mock Interviews**,** Writing personal profile & Company profile**,** Answering unconventional HR questions**,** Dress Code**,** Dining etiquette**,** Interpersonal skills.

Quantitative reasoning -2: Geometry - Circles, Lines and Angles, Polygons, Quadrilaterals, Three-Dimensional Figures, Triangles – **Data Analysis-** Counting Methods, Data Interpretation Examples, Distributions of Data, Random Variables, and Probability Distributions, Graphical Methods for Describing Data, Numerical Methods for Describing Data, Probability.

Text Books:

1. Sanjay Kumar & Pushp Lata, "Communication Skills", Oxford University Press, (2014)
2. Akanksha Makwana, Heeral Bhatt, "IELTS Essay Booster (One Stop Destination for the Writing Module) (English)", MK Book Distributors- Ahmedabad.
3. GRE Analytical Writing: Solutions to the Real Essay Topics (English), Create space Independent Pub
4. Critical Reading: English for Academic Purposes 1st Edition, Pearson Education ESL; 1 edition, (2015)
5. Eric H. Glendinning, Beverly Holmström, "Study Reading: A Course in Reading Skills for Academic Purposes", Cambridge University Press, (2004).
6. M S Rao, "Soft Skills Enhancing Employability – Connecting campus with corporate", International Publishing Pvt Ltd, (2002).
7. R. S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand Publishers, (2010).

ECOLOGY AND ENVIRONMENT

Course code: 15 GN 1001 **L-T-P: 2-0-0**
Pre Requisite: NIL **Credits: 2**
Mapping of the course outcomes with student's outcomes.

CO No.	Course outcome's	Mapped SO	BTL
CO 1	Understand the importance of Environmental education and conservation of natural resources.	h	1
CO 2	Understand the importance of ecosystems and biodiversity.	i	1
CO 3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.	h	2

Syllabus:

The Multidisciplinary nature of Environmental Studies - Introduction to Environment, Definition,scope,importance,Multidisciplinary nature of Environmental Studies, Need for public awareness. Institutions and people in Environment. **Natural Resources**- Renewable and Non Renewable Resources **Forest resources** - Benifits,Deforestation,causes, effects and impacts, Afforestation programmes, Socio-forestry, Agro-forestry, Vanasamrakshana programmes,. **Mining its impact on environment** - mining, dams and their effects on forests and tribal people. **Water resources**- Distribution of surface and ground water, Aquifers, floods, drought, conflicts over water, dams, benefits and problems, Water conservation, rain water harvesting, watershed management, Cloud seeding **Mineral resources**- Use, exploitation, environmental effects. **Food resources**- Changes in agricultural methodologies, comparison between old and new methods of farming, Green Revolution, Environmental Impact Assessment of conversion of agricultural lands, effects of modern agriculture, Drip Irrigation, fertilizer, pesticide problems, Eutrophication, Vermicompost, water logging, Blue baby syndrome. **Energy resources** - Growing energy needs, renewable and non renewable energy sources. **Land resources**-. **Soil erosion**- Importance of soil, Types of soil erosion, Causes and effects of soil erosion. How to control soil erosion. Role of an individual in conservation of natural resources. **Ecosystems** - Concept of an ecosystem, Structure and function of an ecosystem, Energy flow in the ecosystem ,Ecological succession, Food chains, food webs and ecological pyramids. Types of ecosystem. **Biodiversity and its Conservation**- Introduction, Definition, Levels, Values of biodiversity, India as a mega diversity nation. Hotspots of biodiversity. Threats to biodiversity- Endangered and endemic species of India. Conservation of biodiversity- Assessment of Biodiversity and its impact on Environment. **Environnemental Pollution**- Définition, Causes, effects, control measures of Air pollution, Water pollution, oïl pollution, Marine pollution, Noise pollution, Thermal pollution,Nuclear hazards. **Soil waste management**. **Electronic waste management**, **Biomedical waste management** - Role of an individual in prevention of pollution. **Disaster management**–.Climate change, global warming, acid rain, ozone layer depletion. **Environmental Legislation** and objectives of Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife protection Act, Forest conservation Act, Biodiversity Act, Public awareness. **Environmental Impact Assessment Process.**

Text Book:

1. Anubha Kaushik, C.P.Kaushik, "Environmental Studies" , New Age International, (2007).
2. Benny Joseph, "Environmental Studies", Tata McGraw-Hill companies, New Delhi, (2009).

HUMAN VALUES

Course code: 15 GN 1002 **L-T-P: 2-0-0**
Pre Requisite: NIL **Credits: 2**

Mapping of the course outcomes with student's outcomes.

CO No	Course outcome's	Mapped SO	BTL
CO1	Understand and identify the basic aspiration of human beings	f	1
CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.	f	2
CO3	Analyze the profession and his role in this existence.	f	2

Syllabus:

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 fulfill the Basic Human Aspirations.

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.

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.

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.

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

Text Book:

1. R R Gaur, R Sangal and G P Bagaria, " A Foundation Course in Human Values and Professional Ethics", 1st Ed, Excel Books.

BASIC SCIENCES

SINGLE VARIABLE CALCULUS AND MATRIX ALGEBRA

Course Code : 15MT1001 **L-T-P** : 2-2-2
Pre-requisite : Nil **Credits** : 4

Mapping of Course outcomes with Student outcomes:

CO.No	Course outcome	Mapped SO	BTL
CO-1	Formulate physical laws and relations mathematically in the form of first order differential equations and identify a method for solving and interpreting the results.	e	1
CO-2	Formulate physical laws and relations mathematically in the form of second/higher order differential equations and identify a method for solving and interpreting the results.	e	1
CO-3	Provide solutions for Fourier series of periodic/non-periodic phenomenon in models involving differential equations.	e	1
CO-4	Apply numeric solution methods for a system of linear algebraic equations and application oriented matrix eigenvalue problems.	e	1
CO-5	Verify the solution of problems through MATLAB.	k	1

Syllabus:

Differential Equations: Definitions and terminology and mathematical models used in a differential equations. First-order and higher-order differential equations, along with the methods of solutions and their applications. Modeling with first and higher-order also systems of linear first-order differential equations. Solutions of first order ordinary differential equations by Numerical methods.**Fourier series**: Definitions and Fourier series for a periodic signal. Fourier series for simple functions. Fourier series of the summation of sinusoids directly from the definition by using Euler's formula. Solving particular solution to differential equation by Fourier series.**Matrix algebra**: Solving linear System of equations by Gauss-elimination, L U decomposition and Jacobi, Gauss seidal iteration methods, orthogonal, symmetric, skew-symmetric, Hermitian, Skew-Hermitian and unitary matrices, Eigen values, Eigen vectors and their properties, Cayley -Hamilton theorem (without proof) and its applications, and quadratic forms.

Text Books:

1. Erwin Kreyszig ,"Advanced engineering mathematics". JOHN WILEY Publishers , 10 th edition.
2. Green Berg ,"Advanced engineering mathematics", PHI publishers, 2 nd edition.

Reference Books:

1. Differential equations for engineers, WEI-CHAU XIE, Cambridge University Press, New York.
2. Dr. B.S. Grewal ,"Higher Engineering Mathematics',Publisher: Khanna,New Delhi.
3. S.C. Chapra ,"Advanced Numerical methods with Matlab" , Tata Mc-Graw Hill.

MULTI VARIATE CALCULUS

Course code: 15 MT 1203 **L-T-P: 2-2-2**
Pre Requisite: NIL **Credits: 4**
Mapping of Course outcomes with Student outcomes:

CO No.	Course outcome's	Mapped SO	BTL
CO 1	Determine the maximum and minimum values for the function involving two variables	e	2
CO 2	Calculate the length of the arc, area, volume of the surface of a solid revolution	e	2
CO 3	Model the given phenomena as a partial differential equations of first and second orders	k	2
CO 4	Solve the partial differential equations by analytical and finite difference methods	e	2
CO 5	Verify the solution of problems through MATLAB.	k	2

Syllabus:

Differential Calculus: Partial derivatives, Jacobian, total differentiation and their applications, chain rule, Taylor's series for function of two variables, maxima and minima of functions of two variables, Lagrange's multipliers method.

Integral Calculus: Line integrals- length of the arc, double and triple integrals and applications to area, volume, mass & moment of inertia. Change of order of integration, change of variables in polar, cylindrical and spherical polar coordinates.

Vector Calculus: Scalar and vector point functions, gradient and directional derivative of a scalar point function, divergence and curl of a vector point function. Line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications

Modeling with partial differential equations: Formation of partial differential equations, solutions of first order linear and nonlinear PDEs by Lagrange and Charpit's methods, solution of second order PDEs by method of separation of variables i.e., one dimensional wave and heat equations, Laplace equation in two dimensions. Solving Laplace equation by Finite difference method.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, , John Wiley &Sons, Inc, Newyork .(2015)
2. Nakhle H Asmar, "Partial differential equations with Fourier series and boundary value problems", Second edition Pearson Pub.

Reference Books:

1. Michael Greenberg, Advanced Engineering Mathematics. 2nd Ed, **Prentice Hall, USA.**
2. Zafar Ahsan, Differential equations and their applications, 2nd Ed., PHI

PROBABILITY AND OPTIMIZATION TECHNIQUES

Course code : 15 MT 2104 **L T P : 2-2-2**
Pre Requisite : NIL **Credits : 4**

C.O. No.	Course outcome	Mapped SO	BTL
1	To apply the basic rules of theorems of probability theory to determine the probabilities that help to solve the problems of engineering problems and to determine the expectation and variance of a random variable from its distributions.	a,e	2
2	To appropriately choose, define and / or to derive probabibility distributions such as the Binomial, Poisson and normal etc. to model and solve engineering problems	a,e	2
3	To understand how regression analysis can be used to develop an equation that estimate how two variables are related and how the analysis of variance procedure can be used to determine it means of two papulation are equal	a,e	2
4	To have through knowledge on linear and non linear programming	a,e	2

Syllabus:

Probability and Random variables: Definitions of probability, Sample space, Axioms of probability, Conditional probability, Addition, Multiplication and Bayes' theorem. Random variables, Joint and marginal probabilities, Mathematical expectation.

Standard discrete and continuous distributions: Definitions and simple properties of Binomial, Poisson, Geometric, Hyper-Geometric, Uniform, Exponential, Weibull and Normal distributions, Applications of the above distributions.

Correlation and Regression: Correlation coefficient for grouped and ungrouped data, Rank correlation. Linear and Non-Linear Regression.

Linear programming: Formulation of LPPs, Graphical solution of LPP, Simplex method, Big-M method, duality in LPP and dual simplex method.

Nonlinear programming : Convex sets and convex functions, Kuhn-Tucker conditions. Convex quadratic programming: Wolfe's and Pivot complementary algorithms. Separable programming.

Text Books

1. Ronald E. Walpole, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson.
2. H A Taha, Operations Research: An Introduction, Prentice Hall Pub.

Reference Books

1. Richard A Johnson , Miller & Freund's Probability and Statistics for Engineers, 11th Edition PHI, New Delhi
2. Jay L. Devore, Probability and Statistics for Engineers, CENAGE learning.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, S Chand & Sons, New Delhi.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley Pub.
5. S D Sharma, Operations Research, Kedar Nath Ram Nath & Co

PROBABILITY AND STOCHASTIC MODELS

Course Code : 15MT2005 **L-T-P :2-2-2**
Pre-requisite :NIL **Credits : 4**

Mapping of course outcomes with student outcomes:

CO.No	Course outcome	Mapped SO	BTL
1	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance	**e**	**2**
2	Predict the relationship between two variables and construct the linear and non-linear regression lines for the given data	**e**	**2**
3	Model the Single and multi server markovian queuing models with finite and infinite capacity.	**k**	**2**
4	Verify and validate the simulation models.	**k**	2
5	Verify the solution of problems through MATLAB/MINITAB.	**k**	**2**

Syllabus:

Probability and Random variables: Definitions of probability, Sample space, Axioms of probability, Conditional probability, Addition, Multiplication and Bayes' theorem. Random variables, Joint and marginal probabilities, Mathematical expectation.

Standard discrete and continuous distributions: Definitions and simple properties of Binomial, Poisson, Geometric, Hyper-Geometric, Uniform, Exponential, Weibull and Normal distributions, Applications of the above distributions.

Correlation and Regression: Correlation coefficient for grouped and ungrouped data, Rank correlation. Linear and Non-Linear Regression.

Stochastic Processes: Discrete-Time Markov Chains, Continuous- Time Markov Chains.

Queueing models: Single and multi server markovian queuing models with finite and infinite capacity. Networks of queues.

Simulation: Introduction to simulation, simulation examples, general principles, statistical models in simulation. Verification and validation of simulation models.

Text Books

1. Ronald E. Walpole, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson.
2. Kishore S Trivedi, "Probability& Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, Wiley India, 2009.

Reference Books

1. Richard A Johnson , Miller & Freund's Probability and Statistics for Engineers, 11th Edition PHI, New Delhi.
2. Jerry Banks, John S Carson, Barry L Nelson, David M Nicol, Discrete- Event System Simulation, 4th Edition, Pearson
3. Jay L. Devore, Probability and Statistics for Engineers, CENAGE learning.
4. S C Gupta and V K Kapoor , Fundamentals of Mathematical Statistics, 11th Edition, S Chand & Sons, New Delhi.

MECHANICS

Course code: 15 ME 1001 **L-T-P: 2-2-2**

Pre Requisite: NIL **Credits: 4**

Mapping of Course outcomes with Student outcomes:

CO No	Course outcome's	Mapped SO	BTL
CO 1	Apply the concept of forces, governing static equations and analyze planer system of forces. Apply different analytical methods on spatial system of forces and analyzing them	a	2
CO 2	Understanding the concepts of planar and non-planar system of parallel forces and analyzing them. estimate moment of inertia of lamina and material bodies	a	2
CO 3	Analyzing the rigid bodies under translation and rotation with and without considering forces.	e	1
CO 4	Understanding the engineering mechanics physical systems prepare and demonstrate the models with the help of mechanics concepts to solve the engineering problems	e	1
CO5	Apply the concepts of mechanics and carryout different experiments and analyze the results	b	2

Syllabus:

Vectors, Units, Dimensions and conversions

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications, Forces in space, Truss- Method of joints and sections.

Properties of areas and volumes: Centroids, centre of gravity, Moment of inertia- Area and Mass

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Application.

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion.

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium.

Text Books:

1. Stephen Timoshenko, D. Young, J Rao, "Engineering Mechanics" Revised Fourth Edition (in SI Units) (special Indian Edition) , Tata McGraw Hill,

Reference Books:

1. Irving H. Shames "Engineering Mechanics", Prentice-Hall.
2. F.P. Beer and E.R. Johnston "Vector Mechanics for Engineers (in SI units) Statics & Dynamics" – Mc Graw Hill Publications.

ENGINEERING MATERIALS

Course code: 15 PH 1001 **L-T-P : 2-2-2**
Pre Requisite: NIL **Credits: 4**

Mapping of Course outcomes with Student outcomes:

CO No.	Course Outcome	Mapped SO	BTL
CO 1	Understand the concepts of crystallography and crystalline imperfections in order to determine crystal structures and to identify defects in crystals	c	1
CO 2	Understand electrical and optical properties of materials and apply them to know various mechanisms involved in electrical, electronic, optical, optoelectronic devices.	c	1
CO 3	Understand mechanical and thermal properties of materials and apprehend their importance in identification of materials for specific engineering applications	c	1
CO 4	Understand magnetic properties of materials and apply them to know various mechanisms involved in magnetic memory devices and transformers.	c	1
CO 5	Understand various properties of materials and apply the knowledge to execute the related experiments to get hands on experience and also to develop some inter disciplinary projects.	c	1

Syllabus:

Crystallography: Bonding in materials, Space lattice, basis, unit cell, Seven Crystal systems, Bravais lattice system, Reciprocal lattice, Crystal directions, Miller Indices, problems, Diffraction of Crystals, Bragg's Law, XRD, Laue, Rotating Crystal and powder XRD Techniques, Problems.

Crystal Imperfections: Point Defects, Line Defects, Surface Defects, Volume Defects, Effects of Defects on Crystalline Properties.

Electrical Properties: Free Electron Model (Postulates of Classical and Quantum models and their Failures), Bloch theorem (qualitative analysis only), Kronig- Penny model (qualitative analysis only), Brillouin Zones, Energy band theory, Band structures in Conductors, Semi conductors and Insulators, Electrical properties of conductors- Ohms, Mathiessen rule, conductivity, Mobility, Electrical properties of Semi conductors, Factors effecting the carrier concentration , Conductivity and Mobility of charge carriers. Electric properties of Insulator- Dielectrics- Types of Dielectrics, Dielectric Constant, Polarization, Types of Polarizations, Frequency Dependence of Polarization, Ferro, Piezo Electrics.

Optical properties: Optical reflectance, Optical Absorption, Exciton Binding Energy, Raman Effects in Crystals, Energy Loss of Fast Particles in Solids.

Thermal properties: Crystal vibrations with Mono atomic basis, Phonon Momentum, Heat capacity , Thermal Expansion and Thermal Conductivity in Metals, Ceramics and Polymers, Heat treatment of Materials, Hardening, Tempering, Quenching and Nitriding.

Mechanical Properties: Stress, Strain, Hooke's Law, Elasticity, Plasticity, Creep, Ductility, Brittle, Hardness, Strength, Modulus of Elasticity, Fracture, Fatigue, Stress- Strain Behavior of Ductile and Brittle Materials, Hardness Tests- Vickers, Rockwell and Brinell.
Magnetic properties: Origin of Magnetic Moment, Dia, Para, Ferro, Antiferro and Ferri Magnetism, Domain theory and Hysteresis Effect of Ferro and Ferri Magnetism, Soft and Hard Magnetic Materials.

Text Books:

1. William D. Callister,Jr. "Materials Science and Engineering: An Introduction" 6th edition, Wiley India Pvt.Ltd, (2007)
2. Charles Kittel, "Introduction to Solid State Physics" 8th edition, Wiley India Pvt.Ltd,(2012).

Reference Books:

1. Adrianus J. Dekker, *"Solid State Physics"* 1st Edition, Macmillan India Ltd, (*2002).*

ENGINEERING CHEMISTRY

Course Code: 15CY1001 L-T-P : 2-2-2
Pre-requisite: NIL Credits : 4

Mapping of Course outcomes with Student outcomes:

CO No.	Course Outcome	Mapped SO	BTL
CO-1	Predict potential complications from combining various chemicals or metals in an engineering setting.	**c**	**1**
CO-2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena.	**c**	**1**
CO-3	Examine water quality and select appropriate purification technique for intended problem.	**c**	**1**
CO-4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes.	**b**	**1**
CO-5	An ability to analyze & generate experimental skills.	**b**	**1**

Syllabus:
ENERGY SOURCES: Chemical Energy: Basic concepts of electrochemistry – electrode potential, origin of single electrode potential, Galvanic cells, Reference electrodes-Determination of pH using glass electrode. Chemistry, construction and engineering aspects of Primary (zinc-carbon cell) and secondary (lead-Acid cell, Ni-Cd cell, Lithium cells) and fuel cells– Hydrogen–Oxygen fuel cell, advantages of fuel cell. Nuclear Energy: Fission and fusion– power rectors– Atomic pile applications. Solar Energy: Methods of utilization– thermal conversion– Liquid Flat– Plate collector, photovoltaic conversion- solar cell and Applications. Thermal Energy: Fuels, classification– Solid fuels – coal – Liquid fuels – primary – petroleum – cracking, knocking, synthetic petrol, gaseous fuels– natural gas, calorific value of fuel– HCV, LCV. CORROSION AND ITS CORROSION CONTROL: Introduction, causes and different types of corrosion and effects of corrosion. Theories of corrosion– Chemical, Electrochemical corrosion and corrosion reactions; Factors affecting corrosion– Nature of metal, galvanic series, over

voltage, purity of metal, nature of oxide film, nature of corrosion product. Nature of environment- effect of temperature, effect of pH, Humidity, effect of oxidant. Control Methods – Cathodic protection, sacrificial anode, impressed current cathode. Surface coatings: methods of application on metals- hot dipping, galvanizing, tinning, cladding, electroplating; Organic surface coatings– paints constituents and functions. WATER TREATMENT: Introduction, Hardness: Causes, expression of hardness – units – types of hardness, estimation of temporary and permanent hardness of water, numerical problems. Alkalinity and estimation of alkalinity of water, numerical problems. Boiler troubles – Scale & sludge formation, caustic embrittlement, corrosion, priming & foaming. Softening of water: Internal and external treatments -Lime soda, Ion exchange process and Numerical problems. Desalination-reverse osmosis and electro dialysis - domestic water treatment POLYMERS AND PLASTICS: Definition – Types of polymerization – Mechanisms of polymerization. Effect of polymer structure on properties. Plastics – Thermoplastic resins and Thermosetting resins - Compounding of plastics – Fabrication of plastics. Preparation, properties and engineering applications of: polyethylene, PVC, Teflon, Bakelite, Urea Formaldehyde . Conducting Polymers: Poly acetylene, polyaniline, conduction, doping, applications. Liquid Crystal polymers: Characteristics and uses. Nano-Chemistry: Introduction, types of Nano materials, General methods of preparation of Nano materials, Applications. PHASE RULE: Definitions – phase, component, degree of freedom, phase rule equation. Phase diagrams – one component system: water system. Two component system lead - silver system, heat treatment based on iron-carbon phase diagram, hardening, annealing.

Text Book:

1. J C Kuriacose & J Rajaram ,"Chemistry in Engineering and Technology", Volume 2, , TMH, New Delhi.
2. Shashi Chawla, " text book of Engineering Chemistry," Dhanpat Rai , New Delhi.

Reference Books:

1. O G Palanna, ,"Engineering Chemistry", TMH, New Delhi.
2. B. Sivasankar," Engineering Chemistry", TMH, New Delhi.
3. Jain & Jain ,"Engineering Chemistry," , Dhanpat Rai Publishing Company. New Delhi.
4. C Parameswara Murthy, C V Agarwal and Andra Naidu ,"Engineering Chemistry", , B S Publications.

BIOLOGY FOR ENGINEERS

Course Code: 15BT1001 L-T-P : 2-0-0
Pre-requisite: Nil Credits : 2

Mapping of Course outcomes with Student outcomes:

CO No.	Course Outcome	Mapping of SO	BTL
CO-1	Acquire the Knowledge of basic biology	h,j	1,2
CO-2	Acquire the Knowledge of Human Biological Systems	h,j	1,2
CO-3	Acquire Knowledge on Microorganisms and Biosensors	h,j	1,2

Syllabus:

Basic Biology : Introduction, Living organisms, Cell structure and Organelles, Organogenesis, Human Anatomy,

Systems of Life: Digestion, Respiration, Circulation, Excretion, Reproduction, Thinking and coordination and Defense,

Diet and Nutrition: Macro (Carbohydrates, proteins, lipids) - and Micronutrients (vitamins), Essential minerals and their role; deficiency symptoms; and their role; deficiency symptoms.

Micro organisms: Classification of Microorganisms, beneficial and harmful effects of Bacteria, Fungi and Viruses.

Biosensors, biomechanics and Medical Imaging technology, Applications of Biosensor in Food and Agriculture.

Text Books:

1. Dr RC Dubey ,"Advanced Biotechnology", S Chand Publications.
2. P K Gupta ,"Elements of Biotechnology", RASTOGI Publications.

FIELDS & NETWORKS

Course code :15 EE 1201 **L – T – P : 2-2-2**

Pre Requisite :NIL **Credits : 4**

Mapping of Course outcomes with student outcomes

C.O. No.	Course outcome	Mapped SO	BTL
1	Understand the circuit elements, kirchhoff's law and theorems to solve the networks	a,k	1
2	Apply the procedure to determine form factor and peak factor to different symmetrical & unsymmetrical waves.	a	2
3	Apply vector algebra to field fundamentals to analyze electric and magnetic field distributions	a	2
4	Apply Maxwell's equations for static and time varying fields	a	2
5	Test and Analyze the concepts learned in fields and networks by conducting experiments or by any simulation softwares	a	2

Syllabus:

Circuit Concept, R, L, C parameters, voltage and current sources, specifications of Active and Passive elements, voltage – current relationship for passive elements Kirchoff's Laws, Mesh and Nodal methods of analysis of networks.

Network theorems- (without proof): Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer. Star/delta transformation, source transformation,.

AC Circuits- RMS and average values and form factor of different periodic wave forms (Sinusoidal, rectangular, triangle and saw-tooth), steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation, concept of reactance, impedance, susceptance and Admittance, Phase and Phase difference, concept of power factor, Real and Reactive powers, j-notation, complex and polar forms of representations, complex power. Vector Algebra: Co-ordinate systems, Del operator, Gradient of a scalar, Divergence of a vector, Curl of a vector. Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V. Poisson's and Laplace's Equations; Capacitance calculations, related Problems. Magneto Statics: Biot-Savart Law and its applications, Ampere's Circuit Law and Applications, Inconsistency of Ampere's Law, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Lorentz Force Equation, Inductances calculations, related

Problems. Time Varying Fields: Faraday's Law, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces.

Text Books :

1. W.H.Hayt and J.E.Kimmerly "Engineering circuit analysis", McGraw Hill, 5th Edition, 1993.

2. Mathew NO Sadiku, Elements of Electromagnetics, Oxford University Press,2011.

ENGINEERING GEOLOGY

Course code : 15 CE 2103 **L T P :** 3-0-2

Pre Requisite : NIL **Credits : 4**

Mapping of course outcomes with student outcomes

CO. No.	Course outcome	Mapped SO	BTL
1	Understand various geological processes operate on the surface of the earth, impact of the processes on the construction materials.	**a,b,e**	**1**
2	Understand the formation of different types of rocks and their identification and properties and use in sourcing suitable geological materials for construction	**a,e**	**1**
3	Equip with factors leading to various geological hazards and able to identify areas vulnerable to sliding, come out measures to stabilize slopes and seismic vulnerability.	**a,c,e**	**2**
4	Equip with basic knowledge required for identification of suitable site for the proposed construction project, Equip with basic knowledge of hydro geological properties of rocks, identification of potential pockets for tapping groundwater and geological settings that are un favorable / unsafe for construction of dams and driving the tunnels.	**a,c,e**	**2**
5	Able to study various geological features	**a,e**	**2**

Syllabus:

Introduction: Importance of geology from Civil engineering point of view,

Physical G**eology:** Introduction; Weathering Process, types of weathering and its importance in civil engineering; Soil formation, Soil profile, soil conservation measures; Geological action of Rivers, stages in a river system, features of river erosion and deposition.

Mineralogy: Definition of mineral; physical properties of minerals. Study of common rock forming minerals - Quartz, Feldspar, Muscovite, Asbestos calcite, Talc, Kaolin

Petrology: Introduction; Rock Cycle, major rock types, formation of Igneous rocks; Structures of Igneous rocks. Formation of Sedimentary rocks; Structures of Sedimentary Rocks. agents of metamorphism, Structures of Metamorphic rocks, distinguisition of major rock types,

Engineering properties of rocks: Different Engineering property of rocks. Description of some important Rocks Granite - Basalt Dolerite Sand Stone Lime Stone Shale Laterite - Granite gneiss schist Marble K hondalite Charnockite.

Structural geology: Introduction; Strike and Dip; Outcrop. Parts and classification of Folds; Faults; Joints; and their importance in Civil Engineering constructions.

Earthquakes and seismic hazards: Terminology; Classification, Causes and effects of

earthquakes; seismic waves, measuring instruments, seismic zones of India, Seismic belts, seismic hazards in India ; Civil Engineering considerations in seismic areas. A step towards urban earthquake vulnerability reduction

Land slides: Classification; Causes and effects of Landslides; Preventive measures of Landslides.

Site investigation techniques for civil engineering projects: Introduction, Different stages of site investigation, toposheets/topographic maps; Geological maps and their interpretation in site investigation; Geophysics in civil engineering, electrical resistivity investigations, seismic survey, remote sensing, Geographical information systems and their application

Ground water: sources of ground water, factors controlling ground water, water bearing properties of rocks and soils, types of aquifers, exploration of ground water

Dams: Dams terminology; Types of dams and suitable foundations; guidelines for major dam and reservoir investigations;

Tunnels: Purpose of tunneling; types of tunnels, tunnels and underground excavations methods of site selection, tunnel excavation in various rock types, geological problems, Geology of some tunnel sites;

Text Books:

1. D.Venkat Reddy; .Engineering Geology Vikas Publishing House Pvt.Ltd., Noida
2. . Parbin Singh; Engineering and General Geology S. K. Kataria & Sons, New Delhi.

Reference Books:

1. Krynine and Judd, .Engineering Geology and Geo techniques Mc Graw Hill Book Company.
2. Subinoy Gangopadhyay: Engineering geology Oxford University Press
3. K.M. Bangar, Principles of Engineering Geology Standard Publications, Distributors, 1705-B,
   Nai sarak, New Delhi.
4. A text Book of Engineering Geology by N. Chennakesavulu; Macmillan India Ltd., Delhi.
5. Rock Mechanics for Engineers by Dr. B.P.Varma, Khana Publishers, Delhi-6.
6. Principles of Engineering Geology by KVGK Gokhale, B.S. Publications, Hyderabad.

PROBABILITY AND STATISTICS

Course code :15 MT 2103 **L– T–P :** 3-0-0
Pre Requisite :NIL **Credits :** 3

Mapping of course outcome with student out comes:

CO.No	Course outcome	Mapped SO	BTL
CO-1	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance	**a, e**	**2**
CO-2	Predict the relationship between two variables and construct the linear and non-linear regression lines for the given data	**a,e**	**2**
CO-3	Apply statistical tests for large and small samples to test the hypothesis.	**a,e**	**2**
CO-4	Testing the hypothesis to analyze the variance by	a,e	2

	applying suitable design.		

Syllabus:

Probability and Random variables: Definitions of probability, Sample space, Axioms of probability, Conditional probability, Addition, Multiplication and Bayes' theorem. Random variables, Joint and marginal probabilities, Mathematical expectation. **Standard discrete and continuous distributions**: Definitions and simple properties of Binomial, Poisson, Geometric, Hyper-Geometric, Uniform, Exponential, Weibull and Normal distributions, Applications of the above distributions. **Correlation and Regression**: Correlation coefficient for grouped and ungrouped data, Rank correlation. Linear and Non-Linear Regression. **Tests of Hypothesis**: Sampling distributions- Point and interval estimation. Confidence limits for interval of mean and standard deviation. Small sample tests - Test for mean, variance using t, chi-square and F distributions. Chi-square test for independence of attributes and goodness of fit. Large sample tests-Test for mean with known and unknown standard deviation and test for standard deviation.
Analysis of Variance: General principles, Completely randomized design, Randomized block designs and Latin square design.

Text Books:

Richard A Johnson, "Miller & Freund's Probability and Statistics for Engineers", PHI, New Delhi, 11th Edition (2011).

Reference Books:

1. Ronald E. Walpole, Sharon L. Myers, Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition Pearson Pub.
2. S C Gupta and V K Kapoor, "Fundamentals of Mathematical Statistics", 11th Edition ,S Chand & Sons, New Delhi.

BASIC MATHEMATICS

Course Code : 15MT1102 **L-T-P** :2-2-2
Pre-requisite : Nil **Credits** : 4

Mapping of course outcomes with student outcomes:

CO.No	Course outcome	Mapped SO	BTL
CO-1	Apply knowledge of mathematics, fundamentals in biological science problems	**a**	**1**
CO-2	Identify the formulas, for solving complex engineering problems in sciences by using derivatives and Integrals.	**e**	**1**
CO-3	Understand Vector products and their interpretations	**a**	**1**
CO-4	Understand and Interpret conic sections	**a**	**1**
CO-5	Verify the problem models using MAT lab	**k**	**1**

Syllabus:

Ordinary Differential Equations and its Applications : Practical approach to differential equations, First order differential equations, Variable separable method, linear equations, Bernoulli's equation. Models for the real world problems: Newton's Law of Cooling, Law of natural growth and decay. System of first order differential equations (Prey-Predator models).

Applications on Chemical reactions. **Numerical solutions of first order ODE :** Taylor's series method, Euler's method, Runge- Kutta method of fourth order.**Second and High order differential Equations :**Linear differential equations of higher order with constant coefficients, complimentary function, particular integral, method of variation of parameters, **Laplace Transforms and its applications**: Motivation, Definition, Linearity property, Laplace transforms of elementary functions, Shifting theorem, Laplace transforms of periodic,. Inverse Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace Transforms in solving ordinary differential equations.**Partial Differential Equations:** Formation of Partial differential equations, direct integration method, models of first order partial differential equations.

Text Books:

1. Differential equations and their applications, ZAFAR AHSAN, PHI, Second edition.
2. Advanced Engineering Mathematics (Tenth Edition), Erwin Kreyszig,John-Wiley publications

Reference Books:

1. Higher Engineering Mathematics, By Dr. B.S. Grewal. Publisher: Khanna, New Delhi.
2. Elementry Differential Equations, By W.E.Boyce and R. Diprima.
3. Applied numerical methods with MATLAB for engineers and scientists, Steven C. Chapra, third edition, Tata McGraw-hill edition, New Delhi.
4. Differential equations and Mathematical Biology by D.S.Johns,Michael plank,B.D.Sleeman: C.R.C press

ENGINEERING SCIENCES

INTRODUCTION TO ENGINEERING

Course Code: 15GN1004 **L-T-P :2-0-2**
Pre-requisite: Nil **Credits: 3**

Mapping of Course outcomes with Student outcomes:

CO No.	Course Outcome	Mapped SO	BTL
CO-1	Understand the basic principles of engineering design	h	1
CO-2	Understand the aspects of critical thinking and problem solving in engineering	h	2
CO-3	Apply to knowledge of critical thinking to frame real-world problems and provide basic solution approach to such problems from engineering perspective	h	2
CO-4	Understand and analyze the possible career options in Engineering and develop strategic plan, career targets and mechanism to achieve the same.	f	3

Syllabus:

History Of Engineering, What is Engineering, Fields of Specialization in Engineering, **Engineering Design Process, Types of Engineering Design, Societal considerations in**

Engineering Design, The Engineer as a Professional: Characteristics And Responsibilities - Ideals And Obligations Of Professional Engineers - Engineering Ethics - Codes Of Engineering Ethics - Case Studies In Ethics, **Career Paths for Engineers -** Initial Career Profiles, **Engineering Communication and Presentations:** Brief Overview
LAB COMPONENT: **MS Office- MS WORD, MS PPT, MS XCEL**

Text Book:

1. George E Dieter and Linda C Schimidt ,"Engineering Design" , Mc Graw Hill Publications

C PROGRAMMING & DATA STRUCTURES

Course Code: 15CS1001 **L-T-P :**2-4-2
Pre-requisite : Nil **Credits : 5**

Mapping of Course outcomes with Student outcomes:

CO No.	Course Outcome	Mapping of SO	BTL
CO-1	Illustrate how problems are solved using computers and programming.	a	2
CO-2	Interpret & Illustrate user defined C functions and different operations on list of data.	a	2
CO-3	Implement Linear Data Structures and compare them.	e	2
CO-4	Implement Binary Trees.	e	2
CO-5	Apply the knowledge obtained by the course to solve real world problems.	k	2

Syllabus:-
Introduction to C language, Control structures, Functions, recursive functions**.** storage classes and scope of variables. **Arrays-** passing arrays as parameters to functions. **Searching-** linear search, binary search, **Sorting-** Bubble sort, quick sort. Strings, operations on strings and Multidimensional arrays. Pointers, call by value Vs call by reference. Structures and Unions. Dynamic memory allocation. **Stack and Queue-** implementation of Stack, Queue, circular Queue. Infix, post-fix and prefix notations, Stack Applications - Evaluation of infix expression, conversion of infix to post-fix expressions using stacks. **Linked List-** Linked List vs Arrays, Creation, insertion, deletion of Singly linked list, Doubly linked list and Circular linked list . Linked list representation of Stack and Queues. **Trees-** Tree, Binary trees, Binary search tree:- Creation, Insertion, Deletion and Tree traversals.

Text Books:

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language: ANSI C Version", 2/e, Prentice-Hall/Pearson Education-2005.
2. E. Balagurusamy , **"**Programming in ANSI C" 4th ed., Tata McGraw-Hill Education, 2008 .
3. R. F. Gilberg, B. A. Forouzan, "Data Structures", 2nd Edition, Thomson India Edition-

2005.

Reference Books:-

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2008, Third Edition, Pearson Education.
2. Horowitz, Sahni, Anderson Freed, "Fundamentals of Datastructures in C", 2nd Edition-2007.
3. Robert Kruse, C. L. Tondo, Bruce Leung, Shashi Mogalla, "Data structures and Program Design in C", 4th Edition-2007.
4. C for Engineers and Scientists – An Interpretive Approach by Harry H. Cheng, Mc Graw Hill International Edition-2010.
5. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", 7/e, Pearson Education-2004.
6. Jean Paul Trembly Paul G.Sorenson, "An Introduction To Data Structures with applications", 2nd Edition.

ENGINEERING GRAPHICS

Course Code: 15ME1002 **L-T-P :** 0-0-6
Pre-requisites : Nil **Credits :** 3

Mapping of Course outcomes with Student outcomes:

CO No.	Course Outcome	Mapping of SO	BTL
CO-1	Draft orthographic Projections, Isometric views ,projection of planes, Manually and prepare Models in workshop by using drawings.	k	**2**
CO-2	Draftorhtographic projections ,isometric views , projection of planes using Autocad. Draft projection of solids Manually and by using AutoCAD and prepare Models in workshop by using different workshop trades	k	**2**
CO-3	Draft Development of surfaces of solid and sections of solid Manually	k	**2**
CO-4	Practicing house wiring through Auto Cad	k	**2**
CO-5	Develop 2D & 3D components using Auto Cad Software	b	**2**

Syllabus:

Introduction To Computer Aided Drafting: Commands, Tool Bars, Layout of Drawing sheet, Dimensions, Point Style and Text.

Projections Of Points: Theory of Projection, Elements of projection, Planes of projection, Quadrants, Projection of points in four (4) Quadrants and Conclusions.

Projections Of Planes: Different Planes, Projections of planes in various positions w.r.t planes of projection (Use First Angle Projection).

Projections Of Solids: Types of Solids, Names and Nomenclature of Solids, Projection of solids in simple position, Projections of solids with axis inclined to one reference plane and parallel to the other reference plane (Use First Angle Projection).
Orthographic Views: Projection, Orthographic projection, Importance of Front view, Position of Top view and side views w.r.t Front view, Difference between First Angle Projection and Third Angle Projection, Symbol indicating the Angle of Projection.
Sectional Views: Purpose of Sectioning, Types of sections, Importance of Hatching.
Development Of Surfaces: Principle of Development of Surfaces, Methods of Development of Surfaces, Practical Applications of Development of Surfaces.
Isometric Views: Principle of Isometric Projection, Isometric Axes, Isometric lines, Non-Isometric lines, Isometric Planes, Non-Isometric Planes, Isometric scale, Difference between Isometric drawing and Isometric Projection.
Perspective Views: Principle of perspective projection, Definitions of Perspective elements, Methods of Drawing Perspective view(s).

MEASUREMENTS

Course Code: 15GN1003 **L-T-P :0-0-4**
Pre-requisite: Nil **Credits : 2**
Mapping of Course outcomes with Student outcomes:

CO No.	Course Outcome	Mapped SO	BTL
CO-1	Understand and apply the fundamentals of a measurement system, characteristics, and metrology using simulation and experimentation tools.	a,b	2
CO-2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	a,b	2
CO-3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.	a,b	2
CO-4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.	a,b	2
CO-5	Apply the theoretical concepts to measure different parameters	b	2

Syllabus:
Fundamentals of Measurements: Introduction, significance, types, GMS, Static & Dynamic characteristics, Error – types, sources and remedies, Statistical & Regression analysis of data, Transducers – classification.**Metrology:** Definition, types, linear metrology, angular metrology. Straightness, flatness, squareness, parallelism, roundness and cylindricity measurements.

Applications and advanced measurement techniques.**Measurement of Electrical & Computer parameters:** Definition, Representation and analogy of Current, Voltage, Power, Energy, Power factor and R – L – C components. Analog meters: Types, connections, Selection & Extension of range, applications. Electrical Bridge circuits for R, L, and C. Computer terms: Units of digital information, memory measurement, measurement of RAM, Processor speed, internet transfer speed, network connection speed, baud rate. **Measurement of Electronic & Electrophysiological parameters:** DSO – front panel controls, connectivity, measurement of Amplitude and Time period, Phase and Frequency using lissajuous patterns. Applications and advanced measurement techniques. Metric system, Electrophysiological measurements (EEG, ECG, EMG, ERG), tilt measurement, acceleration in human body (jumps), Arm flexion and rotation angle, stability of hand muscles and breathing muscles contraction, pulse rate, blood pressure, oxygen content in exhaled air, registration of algal rest and action bio potentials. Biomedical applications and advanced measurement techniques.**Measurement of Civil & Mechanical parameters:** Definition and representation of Displacement (Linear/Angular), Speed, Force, Torque, Stress/Strain, Flow, Temperature, Humidity, Viscosity. Measurement of angles and distances (height, area, distance between two elevations), Water and waste water analysis (Spectrophotometry/ Chromatography), Liquid Level using Direct and Indirect methods, Hardness of a given material sample using Brinell/Rockwell hardness testing machine, Modulus of Elasticity of a specimen using tension test, measurement analysis of air pollution. Industrial applications and advanced measurement techniques.**NI MyDAQ/ LabVIEW:**
Introduction, Hardware/Software overview, Getting started with MyDAQ (Signal connections), applying the MyDAQ as DMM, DVM, DAM, Oscilloscope, Function Generator, Real-time signal capturing, interfacing of sensors (Thermistor/LM35/Thermocouple/Opto-coupler).

Text books & References:

1. JP Holman ,"Experimental methods for engineers",McGraw Hill Ltd.
2. Thomas G Beckwith ,"Mechanical measurements", 6/E, Pearson
3. Martin U Reissland ,"Electrical measurements"New Age Int.
4. A course in Electrical, Electronic Measurement and Instrumentation- AK Sawhney-Dhanpat Rai & Co.
5. Bewoor ,"Metrology & Measuremen",McGraw Hill Ltd.
6. NI MyDAQ User Manual

OBJECT ORIENTED PROGRAMMING

Course code : 15 CS 2002 L–T–P : 2-2-2
Pre Requisite : NIL Credits : 4

Mapping of Course outcomes with Student outcomes

CO.NO.	Course outcome's	Mapped SO	BTL
CO1	Understand Basic Concepts of OOP, introduction to classes and objects through Java Language and apply.	e	2
CO2	Understand the concepts of constructors, Overloading, parameter passing, access control, Inheritance and apply.	e	2
CO3	Understand Packages, Interfaces, and Exception Handling and apply.	e	2
CO4	Understand I/O Streams & apply and understand Basic Concepts of Multi -Threading	k	3

CO5	Apply OOP concepts for developing an application	k	3

Syllabus:

Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program. Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes. Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The Object class. Packages and Interfaces: Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing & Applying interface. I/O Streams- file, byte streams, character streams, Exception Handling: Exception Handling fundamentals, Types of Exceptions, Usage of try and catch, throw, throws and finally keywords, Multithreading.

Text Books:

1. Herbert Schildt, "The Complete Reference Java2", 7th edition TMH,(2002).
2. Timothy A. Budd, "An Introduction to Object-Oriented Programming", 3/E, Pearson, (2008).

Reference Books:

1. Jim Keogh, "The Complete Reference J2EE", TMH, (2006).
2. Deitel & Deitel, "'JAVA – How to program", 6th edition, PHI,(2007).
3. Cay.S.Horstmann and Gary Cornell "Core Java 2, Vol 1, Fundamentals", Seventh Edition, Pearson Education.

SIGNAL ANALYSIS

Course Code: 15 EC 2002 **L–T–P : 2-2-2**
Pre Requisite : NIL **Credits : 4**

Mapping of the Course Outcomes with Student Outcomes

CO. No.	Course Outcome	Mapped SO	BTL
CO 1	Demonstrate signals and their Spectra	**a**	**2**
CO 2	Analyze discrete time systems	**a**	**2**
CO 3	Design filters to cater signal analysis needs	**k**	**2**
CO 4	Analyze non stationary signals in time	**k**	**2**
CO 5	Analyze non stationary signals in frequency domains	**k**	**2**

Syllabus

Introduction to signal and system, Elementary signals, Signal properties and operations, Orthogonal signal space, Signal approximation using orthogonal functions, Orthogonal Properties of Sinusoidal functions

Exponential and trigonometric Fourier series, Complex Fourier spectrum, Fourier Transform, Properties of Fourier Transform, Fourier transform of Periodic Signals, Case studies
Sampling of continuous time signals, sampling theorem, DTFT, DFT, FFT, Z-Transform, Properties of Z-Transform, Case studies.
DT Systems, Classification of DT systems, System Function, Impulse Response, Response for an arbitrary input, Causality and stability of LTI systems ,case studies
Realization of discrete time systems, Design of Butterworth IIR low pass filter, FIR low pass filter using windows, Case studies
Time frequency analysis: STFT, Wavelet transform and applications, Case studies

Text books

1. Simon Haykin and Barry Van Veen, "Signals and systems", Wiley, (2003).
2. J G Proakis and D G Manolakis, "Digital Signal Processing", Pearson Education, (2007).
3. V. Oppenheim, R.W.Schafer and J R Buck, "Digital Signal Processing", Pearson Education, (2007).
4. M. Vetterli and J. Kovacevic, "Wavelets and Sub band Coding", Prentice Hall, (1995).

Reference Books

1. Alan. V. Oppenheim, Alan.V.Willsky, "Signals and systems", Prentice-Hall signal processing series.
2. Raghuveerrao and AjitS.Bopardikar, "Wavelet transforms: Introduction, Theory and applications", Pearson Education Asia, (2000).
3. Stark, "Wavelets and signal processing: An application based introduction", Springer, (2005).
4. Dimitris G. Manalakis and Vinay Ingle, "Applied Digital Signal Processing, theory, and practice", Cambridge University Press, New York, (2011).
5. S. Mallat, "A Wavelet Tour of Signal Processing", 2nd edition, Academic Press, (1999).

Simulation Books

1. Vinay, Ingle, John G Proakis, "Digital Signal Processing Using Matlab", Pearson Education.
2. Nasser Kehtarnavaz, Namjin Kim, "Digital Signal Processing System Level Design using LabVIEW", Elsevier.
3. E. S. Gopi, "Mathematical Summary for Digital Signal Processing Applications with Matlab", Springer.

DISCRETE MATHEMATICS

Course code : 15 CS 2003 L–T–P: 2-2-2
Pre Requisite :NIL Credits: 4

Mapping of Course outcomes with Student outcomes

CO.NO.	Course outcome's	Mapped SO	BTL
CO1	Understand sets, relations, functions and discrete structures , Count discrete event occurrences	**a**	**2**
CO2	Apply Propositional logic and First order logic to solve problems	**a**	**2**
CO3	Formulate and solve recurrence relations, apply algebraic structures and lattices.	**k**	**2**

CO4	To identify the basic properties of graphs and trees and model simple applications	**k**	**2**
CO5	Relate practical examples to the appropriate set,function or relation model and interpret the associated operations and terminology in context	**k**	**2**

Syllabus:

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy . **Basic Structures: Sets, Functions, Sequences, Sums, and Matrices:** Sets , Set Operations , Functions, Sequences and Summations, Cardinality of Sets, Matrices. **Induction and Recursion** Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness. **Counting:** The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities, Generalized, Permutations and Combinations, Generating Permutations and Combinations. **Advanced Counting Techniques:** Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion , Applications of Inclusion–Exclusion. **Relations:** Relations and Their Properties, *n*-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings,Lattices. **Graphs:** Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. **Trees:** Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees. **Algebraic Structures:** Algebraic Systems-Semi Groups, Monoids-Groups-Subgroups and Homomorphisms- Cosets and Lagrange's Theorem- Ring and Fields (Definitions and Examples).

Text Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Special Indian Edition, 7th Edition, Tata Mcgraw-Hill Publisher, New Delhi.
2. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, (2002).

Reference Books:

1. Joe L. Mott, Abraham Kandel, Theodare P. Baker ,"Discrete mathematics for computer scientists and mathematicians" Second Edition, PHI.
2. Tremplay J P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing Company Limited, New Delhi, (2007).

Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Publications, (2006).

PROFESSIONAL CORE AND PROFESSIONAL ELECTIVES

EMBEDDED SYSTEMS

Course code :15 EM 3103 L – T – P**:** 2 –2 - 2

Pre Requisite : 15 EM 2202 **Credits: 4**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to analyze embedded systems, analyze and program on chip peripherals for a single purpose controller	**c,k**	**2,3**
CO2	Able to interface and program different off chip peripherals and communication protocols used in embedded systems	**c,k**	**2,3**
CO3	Able to understand, evaluate and select appropriate software architectures	**c,k**	**2,3**
CO4	Able to analyze and design embedded systems using the features in real time operating systems.	**c,k**	**2,3**
CO5	Able to develop a prototype for a real time embedded application using project based labs.	**c,k**	**2,3**

SYLLABUS:

Introduction to Embedded Systems: Definition, Comparison with Loaded Systems, Challenges of Embedded systems, Application of Embedded Systems. Hardware fundamentals: Power and decoupling, Open collector out puts, Tristate outputs, Signal loading related issues, Memories type and selectio, Processor types and selection, Timers, Counters, Pulse width Modulators for speed control, LCD Controllers, Key Pad Controllers, Stepper motor controllers, A/D Converters, **Sensors and Actuators:** Temp Sensors, Flow Control devices, Humidity Control devices, Speed Control devices. Interfacing Sensors and Actuators with microcontrollers. **Interfacing:** Communication basics, Basic Terminology, Basic Protocol concepts, I/O Addressing: Port Based Addressing, Bus Based addressing, Interfacing Micro Processors through Interrupts, Shared data problems Interrupt Latency and DMA. **Overview**: Interfacing through Serial Communication using RS232C, I2C, CAN, USB, Wireless Communication using IrDA, Blue Tooth, 802.11g, and Parallel Communication: PCI Bus, AMBA Bus. **Software Architectures and RTOS:** Overview of Round Robin, Round Robin with Interrupts, Function Queue Scheduling, RTOS architectures and selecting the architecture. Real Time Operating Systems: Tasks and Task data, Scheduler, Reentrancy, Semaphores, Semaphore Problems, Message Queues, Mail Boxes, Pipes, Timer Functions, Event Handling, Memory Management, Interrupt Processing, and Power saving Functions. Analysis, Design and Software Development: **Analysis and designing Embedded Systems using RTOS:** Overview, General Design Principles, Hardware and software CO design in Embedded Systems, Real Time Scheduling Considerations, Software development process and tools, Testing and Debugging Techniques, Testing and Debugging Tools.

Text Books:

1. An Embedded Software Premier - David E- Simon, PEARSON Education,2009.
2. Embedded System Design - Frank Vahid / Tony Givargis, WILEY India,2009.

Reference Books:

1. Embedded / real - time systems - DR.K.V.K.K.Prasad, dreamtech,2007.
2. Embedded Systems - Raj – Kamal, Second Edition TMH,2009.

COMPUTER ORGANIZATION AND ARCHITECTURE

Course code : 15 EM 2001 L – T – P: 2 – 2 - 2
Pre Requisite : 15 EC 1101 Credits: 4
Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Understand the functionality and design the CPU functional units - control unit, registers, the arithmetic and logic unit, the instruction execution unit, and the interconnections among these components.	c,k	2
CO2	Understand, analyze and design main, cache and virtual memory organizations.	c,k	2
CO3	Understand, analyze and design different types of I/O transfer techniques.	c,k	2
CO4	Understand the design issues of RISC and CISC CPUs and the design issues of pipeline architectures.	c,k	2
CO5	Able to Design combinational and sequential circuits using LOGISIM	c,k	2

SYLLABUS:

Introduction to computer system and its sub modules, Number System and Representation of information, Arithmetic and Logical operation and hardware implementation of Arithmetic and Logic Unit, Introduction to memory Unit, control unit and Instruction Set. Working with an ALU, Concepts of Machine level programming, Assembly level programming and High level programming. Various addressing modes and designing of an Instruction set. Concepts of subroutine and subroutine call, use of stack for handling subroutine call and return. Introduction to CPU design, Instruction interpretation and execution, Micro-operation and their RTL specification. Hardwired control CPU design. Micro programmed control CPU design. Concepts of semiconductor memory, CPU-memory interaction, organization of memory modules. Cache memory and related mapping and replacement policies. Virtual memory. Introduction to input/output processing, working with video display unit and keyboard and routine to control them. Program controlled I/O transfer. Interrupt controlled I/O transfer, DMA controller. Secondary storage and type of storage devices. Introduction to buses and connecting I/O devices to CPU and memory. Introduction to RISC and CISC paradigm. Design issues of a RISC processor and example of an existing RISC processor. Introduction to pipelining and pipeline hazards, design issues of pipeline architecture. Instruction level parallelism and advanced issues.

Text Books:

1. William Stallings, Computer Organization and Architecture: Designing for Performance, 8/e, Pearson Education India. 2010.
2. D. A. Patterson and J. L. Hennessy, Computer Organization and Design, 4/e, Morgan Kaufmann, 2008.

Reference Books:

1. A. S. Tanenbaum, Structured Computer Organization, 5/e, Prentice Hall of India, 2009.
2. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, Computer Organization, 5/e, McGraw Hill, 2002.

PROCESSORS AND CONTROLLERS

Course code : 15 EM 2202 **L – T – P : 2 – 2 - 2**
Pre Requisite : 15 EC 1101 **Credits : 4**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand and analyze the architectural features of CISC type of General purpose processor Intel 8086 Microprocessor.	e,k	2,3
CO2	Able to understand and analyze the architectural features of CISC type of microcontroller - Intel 8051 Microcontroller.	e,k	2,3
CO3	Able to understand and analyze the architectural features of RISC type of microcontroller – PIC Microcontroller.	e,k	2,3
CO4	Able to program 8086 microprocessor, 8051 and PIC microcontrollers in assembly language using TASM, KEIL, MPLAB and Proteus tools.	e,k	2,3
CO5	Able to Develop a real time application using 8051 & PIC Microcontrollers through project based labs.	e,k	2,3

SYLLABUS:

8086 Microprocessor: Introduction to Microprocessor, Intel Microprocessor families ,8086 Microprocessor architecture, Register Organization, Pin Description, Physical Memory Organization, Modes of operation. 8086 Instruction set & Assembly Language programming: Addressing modes, Instruction set, Assembler directives, simple Programs, Procedures and Macros, 8086 Interrupts. 8051 Microcontroller: Microcontroller families, 8051 Architecture, Signal Description, Register organization, Internal RAM, Special Function Registers, Interrupt control flow, Timer/Counter Operation, Serial Data Communication, and RS-232C Standard.8051 Programming & Interfacing: Addressing modes, Instruction set, Simple Programs involving Arithmetic and Logical Instructions, Timers/Counters, Serial Communication & Interrupts. PIC Microcontroller: Introduction, Architectural overview, Memory organization, interrupts and reset, I/O ports, Timers. Interfacing: Matrix Key Board, Stepper Motor, LCD's, DAC & ADC. using 8051 and PIC Microcontroller.

TEXT BOOKS

1. D.V.Hall "Microprocessor and Interfacing", 2nd Edition Tata McGraw Hill Publishing Company,2006.
2.Mazidi & Mc Kinley "The 8051 Micro controller and Embedded systems: using assembles and C, 2nd edition,2007.

REFERENCE BOOKS

1. A.K. Ray & K. M Bhurchandi, "Advanced Microprocessors & peripherals", Tata Mc Graw Hill Publishing Company 2002.
2. Rajkamal, "Microcontrollers - Architecture, Programming, Interfacing & System Design", 2nd edition, Pearson Education,2009.

COMMUNICATION SYSTEMS

Course code: 15 EM 3104 **L-T-P: 2-2-2**
Pre requisite: 15 EC 2103 **Credits: 4**
Mapping of course outcomes with student outcomes:

CO.No	Course Out come	Mapped SO	BTL
CO1	To Understand the basics of Modulation and demodulation techniques, Different types of filtering techniques and Radio Receiver characteristics.	**b,k**	**2**
CO2	To Understand the sampling techniques and signal to noise ratio of different pulse modulation schemes.	**b,k**	**2**
CO3	To Design the Digital Modulation schemes, bandwidth estimation and clock recovery.	**b,k**	**2**
CO4	To Understand the source coding techniques and estimate the error detection and correction of different block codes	**b,k**	**2**
CO5	Able to design receivers used for Digital communication system using project based labs	**b,k**	**2**

SYLLABUS:

Amplitude Modulation techniques: Introduction to Modulation, Continuous wave AM Generation and Demodulation of AM: DSB, DSB-SC, SSB and VSB. Phase and frequency modulation, narrow band and wide band F.M, Direct and indirect methods of generation of F.M, demodulation of F.M wave.

Transmitters and Revivers: A.M Transmitter and F.M.Transmiter. Armstrong method receiver, AM Superhetrodyne receivers , FM Super hetrodyne receivers.

Pulse modulation techniques: Sampling Process, Types of Sampling, FDM, TDM, Modulation and Demodulation of PAM, PPM & PWM. S/N ratio of PAM, PWM, PWM & PPM, Quantization process, Quantization Noise, PCM, DPCM.

Digital Modulation Techniques: ASK, FSK, BPSK, DPSK, QPSK, QAM, Bandwidth Efficiency, Carrier recovery, Clock recovery.

Information Theory: Uncertainty, Information, Entropy, Source coding theorem: Shannon-Fanon coding, Huffman coding.

Codes: Liner block codes, Cyclic codes, Convolution codes.

Text Books:

1.“Introduction to Analog and Digital Communication System” – By Simon Haykin, 2nd Edition,2009.
2. “Communication Systems” by Singh R.P. and Sapre S.D – TMH,2009.
3. “Advanced Electronic Communication Systems” – By Wayne Tomasi, 6th Edition, PHI,2010.

Reference Books:

1. “Analog and Digital Communications” – By Sam K.Shanmugam, Wiley,2009.
2. “Modern Digital & Analog Communication Systems” – By B.P. Lathi, 3rd Edition,2009.

INTERNET PROGRAMMING

Course code :15 EM 3105 L – T – P : 2-2-2
Pre Requisite : 15 CS 2002 **Credits : 4**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to create Static Web pages using basic HTML & apply CSS	e,k	2,3
CO2	Able to apply javascript features for form validations and event handling	e,k	2,3
CO3	Able to create databases using MYSQL and apply JDBC concepts to connect to a database.	e,k	2,3
CO4	Able to create dynamic web pages using servlets & JSP	e,k	2,3
CO5	Must be able to design WEB site considering the user interface, navigation and interaction with database using project based LABS	e,k	2,3

SYLLABUS:

Introduction to HTML5: Headings, Linking, Images, Lists, Tables, Frames, Forms and Input types.

Cascading Style Sheets (CSS3): Inline Styles, Embedded Style Sheets, Linking External Style Sheets, Positioning Elements.

JavaScript: Control Statements-(if, if-else, switch, while, do-while, for), Document Object Model –objects and collections, Event Handling.

Database Access with JDBC: JDBC architecture, Connection Object, Working with statements, Creating and executing SQL statements, working with Result Set.

Servlets & Java Server Pages: Servlet Basics: Handling the Client Request, Generating the Server Response, Overview of JSP Technology, JSP Scripting Elements, Implicit Objects, Accessing MYSQL Database with JDBC.

Developing sample WEB sites: Online Examination System, Shopping cart, Electricity Bill payment

Text Books :

1.Deitel & Deitel & Nieto, “Internet & World Wide Web – How to Program”, PEA, Fifth Edition.2010.

2.Falkner & Jones," Servlets and Java Server Pages: The J2EE Technology Web Tier", 1/e, Addison-Wesley Professional,2008.

Reference Books:

1.Chris Bates, “Web Programming Building Internet Applications”, 3rd Edition, Wiley India, 2006.

2.Anders Moller, Michael Schwartzbach, “An Introduction to XML and Web Technologies”, 1st Edition, Pearson Education, 2006.

3.Ivan BayRoss, “Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl”, BPB Publication, 3rd Edition, 2005.

4.Uttam K Roy, “Web Technologies”, OXFORD University Press, 2012.

5.“Advanced Java 2 Platform -HOW TO PROGRAM” by H. M.Deitel, P. J. Deitel, S. E. Santry – Prentice Hall.

6.“Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional” by Antonio Goncalves - Apress publication.

VLSI DESIGN

Course Code: 15 EM 3206 **L - T – P: 2-2-2**
Pre Requisite: 15 EC 1101 **Credits : --4**
Mapping of course outcomes with student outcomes:

CO.NO.	COURSE OUTCOME	Mapped SO	BTL
CO1	To understand the VLSI fabrication process and to be able to interact with integrated circuit process engineers	b,k	**2,3**
CO2	Able to analyze Circuit Charactersation ,Performance Estimation and Fault Testing.	b,k	**2,3**
CO3	Able to Understand Full-custom & Semi Custom design methodologies to design different PLD architectures.	b,k	**2,3**
CO4	Analyze different CPLD and FPGA architectures	b,k	**2,3**
CO5	Able to design and simulate digital circuits using Verilog HDL through project based LAbs	b,k	**2,3**

SYLLABUS:

MOS Basics: MOS IC Modelling and Analysis: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & Bi-CMOS Technologies. MOS Fabrication Process, Basic Electrical Properties of MOS Circuits : ***Ids-Vds*** Relationships, MOS Transistor Threshold Voltage ***Vth***, ***gm***, ***gds***, Figure of Merit ***ωo***, Scaling of MOS transistors, Short Channel and Narrow Channel Width Effects.**CMOS Circuits and Test principles:** Various form of Pull-ups, CMOS Inverter Analysis and Design, Bi-CMOS Inverters, Latch up in CMOS Circuits. Simple Symbolic Encodings for NMOS, PMOS, CMOS Logic Gates, MOS Layers, Stick Diagrams, Design Rules and Layouts, CMOS fault models, need for testing, manufacturing test principles. **ASIC Design:** Full Custom Design; Semicustom Design; Standard Cell Based ASIC, Gate Array Based ASIC, Programmable Logic Devices, CPLDs, FPGA, ASIC Design Flow, Economics of ASICs, Frontend Design: RTL coding and synthesis, *Physical Design:* ASIC Cell Library. Placement, Routing, Static Timing Analysis. Computer Aided Design Tools: *Synthesis:* Netlist Generation, Gate Optimization, Technology Mapping. *Programmable ASICs:*.**FPGAs architectures:** Field Programmable Gate Array (FPGA); Xilinx SRAM-Based FPGA; Xilinx – XC2000, XC3000, XC4000, Altera – FLEX 8000, The Antifuse, Static RAM, EPROM and EEPROM Actel – ACT – 1, 2, architectures.

TEXT BOOKS:

1.Kamran Ehraghian, Dauglas A. Pucknell and Sholeh Eshraghiam, “Essentials of VLSI Circuits and Systems” – PHI EEE, 2005.
2.Neil H. E. Weste and David. Harris Ayan Banerjee,, “CMOS VLSI Design” Pearson Education, 1999.
3. Michael John Sebasatian Smith, “Appliction Specific Integrated Circuits” Pearson Education,2005.
4.Stephen M. Trimberger, “Field-Programmable Gate Array Technology”, Springer,2006.

REFERENCE TEXT BOOKS

1.Sung-Mo Kang, Yusuf Leblebici,”CMOS Digital Integrated Circuits” TMH 2003
2.Jan M. Rabaey, “Digital Integrated Circuits” Pearson Education, 2003

3. Pak K. Chan,Samiha Mourad,"Digital Design Using Field Programmable Gate Array", Pearson 2009.
4.Stephen Brown and Zvonko Vranesic "Fundamentals of Digital Logic with Verilog Design" MCH
5. Parag K. Lala, "Digital System Design Programmable Logic Devices", B S Publications,2006.
6.Etienne Sicard, Sonia Delmas Bendhia, "Basics of CMOS Cell Design", TMH, EEE, 2005

AUTOMATA AND COMPILER DESIGN

Course code:15 EM 3207 **L-T-P: 2-2-2**
Prerequisite : 15 CS 2003 **Credits: 4**
Mapping of course outcomes with student outcomes:

SYLLABUS:
Formal Language and Regular Expressions : Languages, Definition Languages regular expressions, **Finite Automata** - DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools.

C.O.No	Course Outcome	Mapped SO	BTL
CO1	Able to analyze formal languages, Grammars and finite automata	a,k	2,3
CO2	Able to analyze the grammar based on top down and bottom up parser.	a,k	2,3
CO3	Able to understand SDT and generate intermediate code	a,k	2,3
CO4	Able to apply code optimization techniques	a,k	2,3
CO5	Able to implement various phases of compiler through project based labs	a,k	2,3

Context Free grammars and parsing : Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing. Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars.
Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code - abstract syntax tree, translation of simple statements and control flow statements. **Context Sensitive features** - Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations. **Run time storage** : Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation. **Code optimization** : Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs. **Code generation** : Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.
TEXT BOOKS :
1. Introduction to Theory of computation.Sipser,2nd Edition,Thomson.,2009.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education,2009.

REFERENCES :

1. Introduction Automata theory and formal languages, and computation, John E Hopcraft and JD Ullman,2007.
2. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.,2005.
3. Compiler Construction, LOUDEN, Thomson,2006.

PROFESSIONAL ELECTIVES

ADVANCED EMBEDDED PROCESSOR ARCHITECTURES

Course code : 15 EM 3251 L – T – P**:** 3 –0 - 0
Pre Requisite :15 EM 2001 **Credits: 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand and analyze the 3 and 5 stage pipelines of ARM and able to program the ARM processor.	**h,k**	**2,1**
CO2	Able to program the on chip & off chip peripherals of ARM 7 controller.	**h,k**	**2,1**
CO3	Understand and analyze the AMBA bus architecture and different advanced ARM cores.	**h,k**	**2,1**
CO4	Able to analyze the different SOC applications using ARM cores.	**h,k**	**2,1**

SYLLABUS:

ARM Processor as System-on-Chip: Acorn RISC Machine – Architecture inheritance – ARM programming model – ARM development tools – 3 and 5 stage pipeline ARM organization – ARM instruction execution and implementation – ARM Co-processor interface. **ARM Assembly Language Programming:** ARM instruction types – data transfer, data processing and control flow instructions – ARM instruction set – Co-processor instructions, Thumb Instruction set. **Architectural Support for System Development:** Advanced Microcontroller bus architecture – ARM memory interface – ARM reference peripheral specification – Hardware system prototyping tools – ARMulator – Debug architecture. **ARM Processor Cores**: ARM7TDMI, ARM8, ARM9TDMI, ARM10TDMI, The AMULET Asynchronous ARM Processors-AMULET1. **Embedded ARM Applications**: The VLSI Ruby II Advanced Communication Processor, The VLSI ISDN Subscriber Processor, The OneCTM VWS22100 GSM chip, The Ericssion-VLSI Bluetooth Baseband Controller, The ARM7500 and ARM7500FE

Text Books

1.ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000,Addison Wesley Professional.
2.Design of System on a Chip: Devices and Components – Ricardo Reis, 1st ed., 2004, Springer

Reference Books

1. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded

Technology) – Jason Andrews – Newnes, BK and CDROM,2005.
2. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001,Kluwer Academic Publishers.

EMBEDDED LINUX

Course code :15 EM 4154 L – T – P **:** 3– 0- 0
Pre Requisite : 15 EM 2001 **Credits : 3**
Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand embedded Linux development environment, understand and create Linux BSP for a hardware platform.	**i,k**	**2,1**
CO2	Able to program different embedded storage devices	**I,k**	**2,1**
CO3	Able to understand the Linux model for embedded storage, understand and write various embedded Linux drivers such as serial, I^2C, and so on.	**i,k**	**2,1**
CO 4	Able to port applications to embedded Linux and write real – time applications in embedded Linux.	**i,k**	**2,1**

SYLLABUS:
Introduction: History of Embedded Linux, Embedded Linux versus Desktop Linux, Embedded Linux Distributions, Architecture of Embedded Linux, Linux Kernel Architecture, Linux Start-Up Sequence, GNU Cross-p\Platform Tool chain. Board Support Package: Inserting BSP in Kernel Build Procedure, Boot Loader Interface, Memory Map, Interrupt Management, PCI Subsystem, Timers, UART, and Power Management.
Embedded Storage: Flash Map, MTD—Memory Technology Device, MTD Architecture, Flash-Mapping Drivers, MTD Block and Character devices, Embedded File systems, Optimizing Storage Space**.**
Embedded Drivers: Linux Serial Driver, Ethernet Driver, I2C subsystem on Linux, USB Gadgets, Watchdog Timer, and Kernel Modules.
Porting Applications: Architectural Comparison, Application Porting Road Map, Programming with Pthreads, Operating System Porting Layer (OSPL), Kernel API Driver. Real-Time Linux: Linux and Real-Time, Real-Time Programming in Linux, Hard Real-Time Linux.

Text Books:
1.Embedded Linux System Design and Development, P.Raghavan, Amol Lad, SriramNeelakandan, 2006, Auerbach Publications
Reference Books:
Embedded Linux – Hardware, Software and Interfacing,2006.

NETWORKING OF EMBEDDED SYSTEMS

Course code :15 EM 4155 L – T – P **: 3 – 0 - 0**
Pre Requisite : 15 EM 2001 **Credits :3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand and develop applications using Rs-232C, RS-485 and SPI communication protocols.	**h,k**	**2,1**
CO2	Able to understand and develop applications using I^2C, USB coomunication protocols.	**h,k**	**2,1**
CO3	Able to understand and develop applications using CAN communication protocols	**h,k**	**2,1**
CO4	Able to understand and analyze different wireless communication protocols used in Embedded Systems.	**h,k**	**2,1**

SYLLABUS:

Networking through Native Serial Communications Systems: RS232 Standard: Features, Configuring UART port of 8051 and LPC 2148 and developing an application. RS 485: Features, Transmission Protocol, Developing an application using RS485 protocol. Synchronous Serial Protocols: Serial Peripheral Interface (SPI) – Features, Master Slave Configuration, Functional Discrepiction, SPL Developing an application using SPI communication interface.

Networking through Inter Integrated Communication (I2C): Drawbacks of RS232C, Features of I2C Starting and Stopping Communication, Receiving data from the Master, Interfacing devices on to the Bus, Acknowledging and Negative acknowledging, Arbitration and Synchronization, Addressing, Developing Applications using PIC based Microcontrollers. **Networking through USB bus:** Features of USB, Upward and Downward communications, USB device Identification, Speed Identification, Monitoring status of USB bus, Data Packet Identification, USB based data flow methods, Enumeration process for Interfacing USB devices on to the Bus, Configuring Descriptors, and Developing application using USB. **Networking through CAN Bus** – Features of CAN Protocols, Differentiating Data on CAN Bus, Bus Termination, CAN Communication Standard, Message Frames, Arbitration methods, Frame overloading, Bit stuffing, CAN identified errors, Normal Bit timing Computational Method, CAN Based Synchronization, Application development using PIC. **Wireless Embedded Networking:** Overview on wireless communication systems covering Wi-Fi, Bluetooth, Zigbee, NFC, Hi-Fi. Wireless sensor networks: Introduction, Applications, Network Topology, Localization, Time Synchronization, Energy efficient MAC protocols, SMAC, Energy efficient and robust routing, Data Centric routing

TEXT BOOKS:

1. Frank Vahid, Givargis 'Embedded Systems Design: A Unified Hardware/Software Introduction', Wiley Publications,2007.
2. Dogan Ibrahim, 'Advanced PIC microcontroller projects in C', Elsevier 2008

Reference Books:

1. Bhaskar Krishnamachari, 'Networking wireless sensors', Cambridge press 2005

SYSTEM ON CHIP ARCHITECTURES

Course code :15 EM 4156 L – T – P **:** 3- 0- 0

Pre Requisite : 15 EM 2001 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand and analyze different Design and Validation methodologies for logic cores such as memories, analog devices and SoCs.	**j,k**	**2,1**
CO2	Able to understand On chip Communication Architecture Standards	**j,k**	**2,1**
CO3	Able to analyze security issues of On chip Communication Architecture standards	**j,k**	**2,1**
CO4	Able to understand and analyze different topologies of Networks on Chip.	**j,k**	**2,1**

SYLLABUS:

Introduction, Design Methodology for Logic cores : SoC Design flow, General guide lines for design reuse, design process for soft, firm and hard cores, system integration. Design Methodology for Memory Cores and Analog cores: Design methodology for embedded memories, specifications of analog circuits.

Design Validation: core level validation, core interface verification, SoC design validation. On-chip communication Architectures: A quick overlook, Basic concepts of bus based communication Architectures: Terminology, characteristics of Bus based communication architectures, data transfer modes, Bus topology types.

On chip Communication Architecture Standard: standard on chip bus based communication architectures; socket based on chip interface standards.

Verification and security Issues in On chip communication Architectures: verification of on chip communication protocols, compliance verification for IP block integration, basic concepts for SoC security, security support in standard bus protocols,

Networks on chip: network topology, switching strategies, routing algorithms, flow control, clocking schemes, NOC architectures.

Text Books:

1. System On a Chip Design and Test? by Rochit Rajsuman, Library of Congress Cataloging-in-Publication Data,2000.
2. On chip communication Architectures? by Sudeep Pasricha and Nikil Dutt , Morgan Kaufmann Publishers,2008

HARDWARE SOFTWARE CO-DESIGN

Course code :15 EM 4157 L – T – P **:** 3 – 0 - 0

Pre Requisite : 15 EM 2001 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Understand and Analyze the co-design models like FSM, DFG	**i,k**	**2,1**

	and target architectures and use the tools required for designing the hardware and software models		
CO2	Analyze Validation and Verification Techniques, design specification for embedded processor architectures	**i,k**	**2,1**
CO3	Analyze the compilation techniques and tools for embedded processor architectures	**I,k**	**2,1**
CO4	Understand the standard design methods like COSYMA system and LYCOS systems.	**i,k**	**2,1**

SYLLABUS:

Introduction to HW-SW Co- Design: Meaning of HW-SW co-design, Co- Design Models, Architectures, Languages, A Generic Co-design Methodology. HW-SW Co-Synthesis.

Co- Synthesis Algorithms: Hardware software synthesis algorithms: hardware – Algorithms for software partitioning distributed system co-synthesis.

Prototyping and Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping.

Target Architectures: Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

Compilation Techniques and Tools for Embedded Processor Architectures: Modern embedded architectures, embedded software development needs, compilation technologies practical consideration in a compiler development environment.

Design Specification and Verification: Design Specification: Design, co-design, the co-design computational model, concurrency coordinating, concurrent computations, interfacing components, **Verification:** Design verification, implementation verification, verification tools, interface verification

Languages for System – Level Specification and Design for homogenous systems System – level specification, design representation for system level synthesis, system level specification languages.

Languages for System – Level Specification and Design in respect of heterogeneous systems, Heterogeneous specifications and multi-language co-simulation the cosyma system and lycos system.

Text Books:

1.Hardware / software co- design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.

2.Hardware / software co- design Principles and Practice, 2002, kluwer academic publishers

WIRELESS SENSOR STREAM

SENSORS AND SENSING PRINCIPLES

Course code : 15 EM 3252 L – T – P **:** 3 – 0 - 0

Pre Requisite :15 CS 2204 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand and analyze the sensor fundamentals, principles and characteristics	**i,j**	**2**
CO2	Understand the application of various physical and Chemical sensors	**i,j**	**2**
CO3	Understand the application of various optical sensors	**i,j**	**2**
CO4	Able to understand the different bio sensors and its limitations.	**i,j**	**2**

SYLLABUS

Sensor Fundamentals: Basic sensor technology -sensor characteristics –static and dynamic – Principles of sensing- capacitance- magnetic and electromagnetic induction –resistance – piezoelectric effect –Pyroelectric effect -Hall effect- See beck and Pettier effect-heat transfer-light. Sensor Characteristics: Analysis of experimental data: causes and types of experimental errors – statistical analysis of experimental data –method of least squares –correlation coefficient, multivariable regression – graphical analysis and curve fitting. Physical /Chemical sensors: Position, Displacement and Level sensors, Velocity and Acceleration sensors, Force, Strain, Tactile and pressure sensors. Classification of chemical sensing Mechanism, Potentiometric sensors, Conduct metric Sensors, Amperometric Sensors, Enhanced Catalytic gas Sensors. Optical Sensors: Optical Radiation- Electromagnetic Spectrum, Snell's Law and Total internal reflection, Diffraction principles, Optical Detectors and Sources-Photo diodes and transistors, Photo-darling ton pairs, Photoconductive sensors, CCD sensors, Fiber optic sensors. Solid state light sources- LED , Diode lasers, Semiconductor laser optical cavity resonator. Bio sensors Origin and Transmission of bioelectrical Signals, The Electromyogram (EMG) & the Electrocardiogram (ECG) The Electroencephalogram (EEG) & Blood pressure measurement, Catalytic biosensors, mono-enzyme electrodes, bi-enzyme electrodes. cell based biosensors, biochips and biosensor arrays, problems and limitations.

Text books:

1. Biosensor Principles and Applications, Edited by Loïc J.Blum, Pierre R. Coulet Agarwal, Govind P, "fiber Optic Communication Systems", 2nd edition, Wiley, NewYork,1997
2. Principles of Biochemistry Albert L.Lehninger, David Lee Nelson,Michael M. 2005, Fourth Edition.
3. Sensors and Transducers D. Patranabis Prentice-Hall of India Pvt.Ltd August 15, 2004
4.Jacob Fraden, " Hand Book of Modern Sensors: physics, Designs and Applications",3rded.,Springer,2003.

WIRELESS COMMUNICATIONS & NETWORKS

Course code :15 EM 4158 L – T – P **:** 3 – 0- 0
Pre Requisite : 15 CS 2204 **Credits:3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand Transmission fundamentals and communications networks and application protocol architecture	**i,j**	**2**
CO2	Able to understand and analyze signal encoding techniques, spectrum	**i,j**	**2**

	and different wireless networks		
CO3	Able to understand and analyze various principles of cellular wireless networks	**i,j**	**2**
CO4	Able to understand wireless protocols and applications of IEEE802.11 architecture and standards	**i,j**	**2**

SYLLABUS:

Introduction- Wireless Comes of Age. The Cellular Revolution. The Global Cellular Network. Broadband. The Trouble with **Transmission Fundamentals** -Wireless Signals for Conveying Information. Analog and Digital Data Transmission. Channel Capacity. Transmission Media. Multiplexing. **Communication Networks-** LANs, MANs, and WANs. Switching Techniques. Circuit-Switching. Packet-Switching. Asynchronous Transfer mode. **Protocols and the TCP/IP Suite** - The Need for a Protocol Architecture. The TCP/IP Protocol Architecture. The OSI Protocol Architecture, internetworking. **WIRELESS COMMUNICATION TECHNOLOGY: Antennas and Propagation-** Antennas. Propagation Modes. Line-of-Sight Transmission. Fading in the Mobile Environment. **Signal Encoding Techniques-** Signal Encoding Criteria. Digital Data, Analog Signals. Analog Data, Analog Signals. Analog Data, Digital signals .**Spread Spectrum-** The Concept of Spread Spectrum. Frequency Hopping Spread Spectrum. Direct Sequence Spread Spectrum. Code-Division Multiple Access. Generation of Spreading Sequences. **Coding and Error Control- WIRELESS NETWORKING- Cellular Wireless Networks** Principles of Cellular Networks. First Generation Analog. Second Generation TDMA. Second Generation CDMA. Third Generation Systems . **Cordless Systems and Wireless Local Loop-** Cordless Systems. Wireless Local Loop. IEEE 802.16 Fixed Broadband Wireless Access Standard. **Mobile IP and Wireless Access Protocol-** Mobile IP. Wireless Application Protocol. **Wireless LAN Technology-** Overview. Infrared LANs. Spread Spectrum LANs. Narrowband Microwave LANs. **IEEE 802.11 Wireless LAN Standard-** IEEE 802 Protocol Architecture. IEEE 802.11 Architecture and Services. IEEE 802.11 Medium Access Control, IEEE 802.11 Physical Layer. **Bluetooth-** Overview. Radio Specifications. Baseband Specification. Link Manager Specification. Logical Link Control and adaptation protocol.

TEXTBOOKS:

1. William Stallings, "Wireless Communications and Networks", Pearson Education, 2005
2. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2001.

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First dition, Pearson Education, 2001.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2001.

WIRELESS SENSOR NETWORKS.

Course code :15 EM 4159 L – T – P **:** 3 – 0 - 0
Pre Requisite :15 CS 2204 **Credits : 3**
Mapping of course outcomes with student outcomes:

C.O. No.	**Course outcome**	**Mapped SLO**	**BTL**

CO1	Able to understand Cellular and adhoc networks in detail	**i,k**	**2**
CO2	Able to understand wireless sensor networks data communications to other networks which involves its design and principles	**i,k**	**2**
CO3	Able to understand various MAC protocols for sensor networks	**i,k**	**2**
CO4	Able to understand and analyze various routing techniques of wsn and ad hoc networks	**i,k**	**2**

SYLLABUS:

Cellular and Ad Hoc Wireless Networks-Applications of Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks: Medium Access Scheme-Routing-Multicasting Transport Layer Protocols-Pricing Scheme-Quality of Service Provisioning-Self Organization-Security-Addressing and Service Discovery-Energy management Scalability-Deployment Considerations, Ad Hoc Wireless Internet. **Comparison with Adhoc wireless networks**-Challenges for WSNs – Difference between sensor networks and Traditional sensor networks ,Types of Applications, Enabling Technologies for Wireless Sensor Networks –Single Node Architectures , Hardware Components , Energy Consumption of Sensor Nodes, Issues in Designing aMulticast Routing Protocol.**Data Dissemination**-Flooding and Gossiping-Data gathering Sensor Network Scenarios –Optimization Goals and Figures of Merit – Design Principles for WSNs Gateway Concepts – Need for gateway – WSN to Internet Communication –Internet to WSN Communication –WSN Tunneling**MAC Protocols for Sensor Networks** -Location Discovery-Quality of Sensor Networks Evolving Standards-Other Issues- Low duty cycle and wake up concepts- The IEEE802.15.4 MAC Protocols- Energy Efficiency -Geographic Routing Mobile nodes **Gossiping and Agent based Unicast Forwarding**-Energy Efficient Unicast-Broadcastand Multicast-Geographic Routing-Mobile nodes-Security-Application SpecificSupport - Target detection and tracking-Contour/ edge detection-Field Sampling.

Text Books:

1. Holger Karl and Andreas Wiilig, “Protocols and Architectures for Wireless Sensor Networks” John Wiley & Sons Limited 2008.
2. I.F .Akyildiz and Weillian, “A Survey on Sensor Networks”,IEEE Communication Magazine, August 2007.

Reference Books:

1. Wilson , “Sensor Technology hand book,” Elsevier publications 2005.
2. Anna Hac “Wireless Sensor Networks Design,” John Wiley& Sons Limited Publications 2003.
3. C.Siva Ram Murthy and B.S.Manoj “Ad Hoc Wireless Networks,” Pearson Edition 2005

SENSOR NETWORKS PROGRAMMING

Course code :15 EM 4160 L – T – P**: 3 – 0 - 0**
Pre Requisite : 15 CS 2204 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SLO	BTL
CO1	Able to understand fundamentals of TinyOS and nesC in wsn environment.	**i,k**	**2,1**
CO2	Able to understand real world programming of wireless sensor	**i,k**	**2,1**

	network in different scenarios.		
CO3	Able to understand the performance analysis of power-aware algorithms	**I,k**	**2,1**
CO4	Able to understand and develop energy efficient algorithms for wireless sensor networks thru simulation or real time experiments	**i,k**	**2,1**

SYLLABUS

Introduction :Some Foundational Information , Next-Generation Sensor Networked Tiny Devices , Sensor Network Software Performance-Driven Network Software Programming ,Unique Characteristics of Programming Environments for Sensor Networks , Why TinyOS and NesC , Future Demands on Sensor-Based Software Wireless Sensor Networks :Sensor Network Applications ,Characteristics of Sensor Networks ,Nature of Data in Sensor Networks Sensor Technology: Sensor Level Server Level **,**Client Level **,**Programming Tools .**Tiny Operating System (TinyOS)** Components of TinyOS,An Introduction to NesC ,,Event-Driven Programming.Programming in NesC NesC Programming A Simple Program, SENSOR NETWORK IMPLEMENTATION. Sensor Programming :Programming Challenges in Wireless Sensor Networks,Sensing the World Applications Using the Interface SplitControl. **REAL-WORLD SCENARIOS**: Sensor Deployment Abstraction:Sensor Network Abstraction Data Aggregation ,Collaboration Group Abstractions ,Programming Beyond Individual Nodes 205 Standards for Building Wireless Sensor Network Applications :802.XX Industry Frequency and Data Rates ZigBee Devices and Components ZigBee Application Development Dissemination and Evaluation for Real-Time Environment Motivation and Background ,Software Microframework Requirements **Performance Analysis of Power-Aware Algorithms** : Introduction Service Architecture 242 Approaches To WSN Programmability ,Simulation Capabilities ,Benchmarking Modeling Sensor Networks Through Design and Simulation :Introduction, Why a New Simulator Currently Available Simulators ,Simulation Design ,Implementation Details ,Experimental Results

MATLAB Simulation of Airport Baggage-Handling System :Introduction, proposed Architecture

Text Books:

1.Fundamentals of Sensor Network Programming: Applications and Technology Hardcover Dec 2010 by S. Sitharama Iyengar ,Nandan Parameshwaran, Vir V. Phoha.

2.Fundamentals of Sensor Network Programming: Applications and Technology S. Sitharama Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye ISBN: 978-0-470-87614-5

Reference Books:

Developing a Wireless Sensor Network Programming Language Application Guide Using Memsic Devices and LabVIEW

REMOTE SENSING

Course code : 15 EM 4161 L – T – P**:** 3 – 0 - 0

Pre Requisite : 15 CS 2204 **Credits:3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Able to understand relations of remote sensing with atmosphere and earth	**i,k**	**2,1**
CO2	Able to understand and remote sensing platforms and sensors for data analysis and interpretation	**i,k**	**2,1**
CO3	Understand the basic components of GIS	**i,k**	**2,1**
CO4	Understand data storage and analysis of GIS data.	**i,k**	**2,1**

SYLLABUS:

EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL: Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.**PLATFORMS AND SENSORS** Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Activesensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and spaceborne TIR and microwave sensors. IMAGEINTERPRETATIONANDANALYSIS Types of Data Products – types of image interpretation – basic elements of image interpretation- visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised. **GEOGRAPHIC INFORMATION SYSTEM** Introduction – Maps – Definitions – Map projections – types of map projections – map analysis –GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial andnon-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS). **DATAENTRY, STORAGE AND ANALYSIS**Data models – vector and raster data – data compression – data input by digitization andscanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System.

TEXTBOOKS

1.Lillesand,T.M.,Kiefer,R.W.andJ.W.Chipman.(2004).RemoteSensingandImageInterpretation. V Edn.JohnWilleyandSons(Asia)Pvt.Ltd.,NewDelhi.

2. Anji Reddy, M. (2001). Textbook of Remote Sensing and Geographical Information System. Secondedn.BSPublications,Hyderabad.

REFERENCES

1. Lo. C.P.and A.K.W.Yeung (2002). Concepts and Techniques of Geographic Information Systems.Prentice-HallofIndiaPvt.Ltd.,NewDelhi.Pp:492.

2. Peter A.Burrough, Rachael A.McDonnell (2000). Principles of GIS. Oxford University Press.

3. Ian Heywood (2000). An Introduction to GIS. Pearson Education Asia.

WEB TECHNOLOGIES STREAM

WEB SERVICES

Course code : 15 EM 3253 L – T – P : 3-0-0
Pre Requisite : 15 CS 2002 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Must be hands-on in developing two tier/ three tier WEB based applications using APACHE and NETBEANS as the Platform	i,j,k	2,2,1
CO2	Must have theoretical knowledge of all the programming languages, WEB services related technologies and API as detailed in the syllabus	i,j,k	2,2,1
CO3	Able to understand fundamentals of SOAP,WSDL & UDDI	i,j,k	2,2,1
CO4	Must be able to design, develop, register, deploy WEB Services and develop a real life application considering WEB services server and UDDI registry	i,j,k	2,2,1

SYLLABUS:

Introduction: Introduction to Web Services, Web Service Architecture, XML Messaging, Service Description: WSDL, Service Discovery: UDDI, Service Transport, Using WEB service technologies together. Standards related to WEB service. **XML-RPC Essentials**: XML-RPC Overview, the need for XML-RPC, XML-RPC Technical Overview, Developing using XML-RPC, Beyond simple XML-RPC Calls. **SOAP Essentials**: SOAP 101, The SOAP Message, SOAP Encoding, SOAP via HTTP, SOAP and the W3C, SOAP Implementations, Using Apache SOAP: Installing Apache SOAP, Developing a simple SOAP message, Deploying SOAP Services, Programming using Apache SOAP: Working with Arrays, Working with JavaBeans, Working with Literal XML Documents, Handling SOAP Faults, Maintaining Session State. **WSDL**: The WSDL Specification, Basic WSDL Example: HelloService.wsdl, Invoking WSDL, Basic WSDL Invocation methods(Part-1) Xmethods, Basic WSDL Invocation methods (Part-2) Xmethods, Generating WSDL Files, XML Schema Data Typing. **UDDI Essentials**: Introduction to UDDI , UDDI Technical Overview, UDDI Data Model, Searching UDDI, Publishing to UDDI, UDDI Implementations, Web Resources, UDDI Inquiry API: The UDDI Inquiry API, Find Qualifiers, Finding and Retrieving UDDI Data, Publishing UDDI Data, UDDI4J Quick Reference API. **Developing Sample Applications using WEB services**: Income Tax Calculation, Purchase order processing, Invoicing and Billing

Text Books :

Web Services Essentials By Ethan Cerami, Orielly ,2002.

Reference Books:

1.Java Web Services David A. Chappel & Jewell,Oreilly,2009.
2.Web Services Concepts, Architectures and applications by Gustavo Alonso.,Springer,2009.

WEB SEMANTICS

Course code : 15 EM 4162 L – T – P : 3-0-0
Pre Requisite : : 15 CS 2002 **Credits : 3**
Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Must Acquire theoretical knowledge related to WEB semantics, ontology learning and languages that can be used for the development of WEB semantics	i,j,k	1,2,1
CO2	Must be knowledgeable using tools to develop web semantics for various real life applications	i,j,k	1,2,1
CO3	Able to understand ontology Management & learning for semantic web	i,j,k	1,2,1
CO4	Must develop a real life application that require use of WEB semantics	i,j,k	1,2,1

SYLLABUS:

Introduction: Introduction to WEB semantics – Meaning and Reason. The Concept of Ontology, The langue of Ontology**,** Ontological Categories, Knowledge Representation Ontologies, Top Level Ontologies, Linguistic Ontologies, Domain Ontologies, Semantic Web: Need, Foundation, Layers, Architecture. **Languages for Semantic Web and Ontologies:** Web Documents in XML, RDF – Schema, Web Resource Description using RDF, RDF Properties, Topic Maps and RDF, RDF Overview, RDF Syntax Structure, RDF Semantics, RDF Pragmatics, Brief review of Traditional Ontology Languages: LOOM, OKBC,, OCML, F-logic Ontology, Brief review of Markup Languages: SHOE, OIL, DAML, OIL, OWL .**Ontology Learning for Semantic Web:** Taxonomy for Ontology Learning,– Layered Approach, Phases of Ontology Learning, Importing and Processing Ontologies and Documents, Ontology Learning Algorithms, Evaluation. **Ontology Management and Tools: N**eed for ontology management, development process, target ontology, ontology mapping, skills management system, ontological class, constraints, issues. Evolution, Development of Tools and Tool Suites, Ontology Merge Tools, Ontology based Annotation Tools. Use of Proteage tool for the development of Ontology. **Applications: Developing ontology for the** applications such as Insurance system, banking system and a Retail Trading System which are developed using various types of sources that of type structured, unstructured and semi-structured data (HTML. XML, RDBMS)

Text Books:

1.Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez "Ontological Engineering: with examples from the areas of Knowledge Management, eCommerce and the Semantic Web" Springer, 2004.
2.Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer (Cooperative Information Systems)", The MIT Press, 2004.

Reference Books:

1.Alexander Maedche, "Ontology Learning for the Semantic Web", Springer; 1 edition, 2002.
2.John Davies, Dieter Fensel, Frank Van Harmelen, "Towards the Semantic Web: Ontology – Driven Knowledge Management", John Wiley & Sons Ltd., 2003.

3.John Davies (Editor), Rudi Studer (Co-Editor), Paul Warren (Co-Editor) "Semantic Web Technologies: Trends and Research in Ontology-based Systems"Wiley Publications, Jul 2006
4.Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, "Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential", The MIT Press, 2002.
5.Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, "The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management", Wiley, 2003.

ENTERPRISE PROGRAMMING

Course code :15EM4163 L – T – P : 3-0-0
Pre Requisite : 15CS2002 **Credits : 3**
Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Must acquire theoretical knowledge related to enterprise architectures, development platforms, Application servers, EJB components, EJB query language.	i,j,k	2,2,1
CO2	Must be hands-on developing EJB components using NETBEANS and deploy the components using JBOSS	i,j,k	2,2,1
CO3	Able to understand EJB QL & develop sample applications	i,j,k	2,2,1
CO4	Must develop real life Enterprise wide application based on EJB and JBOSS and SQL server as DBMS engine	i,j,k	2,2,1

SYLLABUS:

Introduction to Enterprise Systems: Meaning of an Enterprise, Difference between an enterprise and a business establishment, EE infrastructure support in JAVA. **Multi-Tier Architectures used for implementing IT for enterprises**: Single tier systems, Client server and N. Tier Architectures, Features of JAVA EE: Clients, servers, containers, Servlets, JSP, JDBC, EJBS, XML support, WEB services, Transaction support, Security, JAVA EE Architectures: client with EJB, JSP Client with EJB, Applet client with JSP and Database, WEB services oriented implementation. **Introduction to application server**: Meaning and purpose, Installing JBOSS, developing a sample EJB application and deploying under JBOSS and running the same: Introduction to component technologies, Role of Component technologies in implementing the Enterprise solutions, EJB Fundaments: EJB specification, Kinds of EJB. **EJB Session Beans:** Purpose, Meaning and Purpose of Stateful and Stateless session beans, Using Stateful and Stateless session beans, Sample application that uses a session bean. **SQL and EJB SQL**: Introduction to SQL, SQL Objects, SQL Data types, Creating Tables, Selecting Data from Tables, Modifying Table Data, Constructing Joins, Introduction to EJB QL: Entity Bean references, Javax.ejb.Query Object, Building EJB Queries, using relationships. **EJB Entity Beans**: Working of Entity beans with sessions beans, Anatomy of Entity bean, Entity Bean class, Managing persistence and Entity Manager Interface. **EJB Query Language**: EJB QL queries, running EJB QL within Session beans, Developing a sample application using Entity Beans. **EJB, EJB QL and JDBC:** Entity Bean relationships: One-to-Many, Many-to-many, Container managed relationships and EJB QL, Using JDBC with EJB Entity Beans, Message driven beans: Describing MDBs, MDB context, MDB Transactions, Invocation of an Interceptor, Java

Message API, EJB Timer services, Developing a sample application using Message driven beans.

Text Books :

Kevin Mukhar and Chris Zelenak, "Beginning Java EE From Novice to professional, APRESS publications,2009.

Reference Books:

1.Antonio Goncalves, "Beginning Java™ EE 6 Platform with GlassFish™ 3 Novice to Professional", Apress, 2009 Edition
2.Jan Graba, "An Introduction to Network Programming with Java", Springer, 2nd edition, 2006.
3.Mark D Hansen, "SOA Using Java web services", Pearson, 2007.
4.Dreamtech Software Team, "Java Server Programming J2EE: Black Book", Wiley, 2007.

CLOUD BASED WEB DEVELOPMENT

Course code :15 EM 4164 L – T – P: 3-0-0
Pre Requisite : 15 CS 2002 **Credits : 3**
Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Must acquire theoretical knowledge related to WEB Applications, Cloud computing and deploying WEB applications on the cloud	i,j,k	2,2,1
CO2	Must be hands-on developing WEB Applications using Google APP / Open ERA	i,j,k	2,2,1
CO3	Able to understand basic cloud based application development environment	i,j,k	2,2,1
CO4	Must be able to develop real life cloud based applications through Google APP / Open ERA	i,j,k	2,2,1

SYLLABUS:

Web Application development: Overview: Architectures, Technologies: HTML, DHTML, PHP, JSP, JDBC, Overview on Enterprise development: Definition, Architectures, Technologies: Java.Net, Java. Tran, Java. Message, Application server. Component technologies: EJB specification, development, deployment, Developing Applications: WEB based and Enterprise based, Overview on WEB services: Architectures, Technologies. **Cloud computing fundamentals:** Cloud Computing definition, private, and public and hybrid cloud. Cloud based services ; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; **Business Agility**: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications. **Deploying WEB services on the clouds:** Technologies and the processes required when deploying web services; deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, **Management of WEB services hosted on the clouds:** Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on

application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat). **Cloud based application development environment:** Service creation environments to develop cloud based applications. Development environments for service development; Open ERA, Google App. Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development deployment so as to improve the total cost of ownership (TCO). **Cloud based WEB application development:** Technical architecture considerations – concurrency, speed and unpredictable loads. Agile development, team composition (including roles/responsibilities), working with changing requirements and aggressive schedules. Understanding Model View Controller (MVC). Advanced understanding of "views", location, and the presentation layer: Advanced Ajax and JQuery. Presenting to different browsers and devices. Localization and internationalization; Understanding client location and device type.

Text Books:

1.Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition, [ISBN: 978- 0521137355], 2010.
2.Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.

Reference Books:

1.Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN: 1439834539],2010.
2.Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski, "Developing Applications for the Cloud on the Microsoft Windows Azure Platform" Microsoft Press; 1 edition, [ISBN: 9780735656062] 2010.
3.Dan Wellman, "jQuery UI 1.6" Packt Publishing [ISBN: 9781847195128] 2009.
4.Peter Lubbers, Brian Albers, Frank Salem, Ric Smith, "Pro HTML5 Programming" A press, [ISBN: 9781430227908] 2010.
5.Lee Babin, "Beginning Ajax with PHP" A press; 1 edition, [ISBN: 9781590596678] 2000.

WEB ANALYTICS

Course code :15 EM 4165 L – T – P: 3-0-0
Pre Requisite : 15 CS 2002 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SO	BTL
CO1	Must acquire theoretical knowledge related to WEB Analytics, processing clicked streams, metrics for WEB analytics	i,j,k	2,2,1
CO2	Must be hands-on developing WEB Analytics using NINJA	i,j,k	2,2,1
CO3	Able to understand basics of analytics related to social,mobile & video.	i,j,k	2,2,1
CO4	Must be able to develop applications that require WEB analytics	i,j,k	2,2,1

SYLLABUS:

Introduction- Analytics – WEB Analytics – Meaning, State of WEB Analytics, Elements of WEB Analytics: Clicked streams, Analysis of Multiple Outcomes Analysis, Experimentation and Testing , including the Voice of Customer, Competitive Intelligence , The Strategic Imperative, Tactical Shift, Bonus Analytics. **Metrics for WEB analytics -** Eight Critical Web Metrics ,Visits and Visitors, Time on Page, Time on Site, Bounce Rate, Exit Rate, Conversion Rate, Engagement, Strategically-aligned Impactful Web Metrics, Diagnosing the Root Cause of a Metric's Performance: Conversion ,Leveraging Custom Reporting, Starting with Macro Insights. **Processing Clickstreams:** Web Analytics Primer, getting primitive indicators out of the way, Understanding Visitor Acquisition Strengths, Click Density Analysis, Counting user Visits for purchasing, Reporting Web Analytics, Sources of Traffic, Outcomes, Foundational Analytical Strategies, WEB segmenting, Capturing user Behavior, Analyzing everyday clickstreams, Site Search Analysis, Search Engine Optimization, Pay Per Click / Paid Search Analysis, Direct Traffic Analysis, Email campaign analysis, Rich experience analysis: Flash, Video, and Widgets, Reality Check: Prospect Perspectives on key web analytics challenges, visitor tracking cookies, data sampling, the value of historical data, the usefulness of video playback of customer experience ,the ultimate data reconciliation checklist. **Emerging Analytics related to Social, Mobile, and Video:** Measuring the new social web: The data challenge, the content democracy evolution ,The twitter revolution ,Analyzing offline customer experiences (Applications), Analyzing mobile customer experiences, **Mobile data collection:** Options, Mobile Reporting and Analysis, Measuring the success of blogs, raw author contribution, Holistic audience growth, Citations and ripple index ,Cost of blogging, Benefit from blogging ,Quantifying the impact of twitter ,Growth in number of followers ,Message amplification ,Click-through rates and conversions, Conversation rate ,Emerging twitter metrics, Analyzing performance of Videos, Data collection for videos, Key video metrics and Analysis, Advanced video analysis. **Working with NINJA WEB Analytic tool –**Working with Ninja, Comparing Key Metrics, Performance analysis for different time periods, Providing context through segmenting, Comparing key metrics and segments against site average, Joining PALM (People Against Lonely Metrics) ,Leveraging Industry Benchmarks and Competitive Data, True Value: Measuring latent conversions and visitor behavior, Latent Visitor Behavior Latent Conversions, KPI Measurement Techniques ,Averages percentages ratios, Compound or Calculated Metrics, Searching: Achieving the optimal long-tail strategy, Computing head and tail, Understanding branding and category terms, The optimal search marketing strategy ,Executing the optimal long-tail strategy, Measuring the value of upper funnel keywords, Advanced pay-per-click analyses, Identifying keyword arbitrage opportunities

Text Books :

1."Web Analytics 2.0 The Art of Online Accountability & Science of Customer Centricity", Avinash Koushik, Wiley Publishing, Inc., ISBN: 978-0-470-52939-3.

Reference Books:

1."Advanced Web Metrics with Google Analytics™, Third Edition, B r i a n C l i f t o n John Wiley & Sons, Inc, ISBN: 978-1-118-16844-8.

OPEN ELECTIVES

LINUX PROGRAMMING

Course Code : 15 EM 30B1 **L-T-P 3-0-0**
Prerequisite: Nil **Credits:** 3

Mapping of Course out comes with student out comes:

CO No.	Course outcome	Mapped SO	BTL
CO1	Describe and understand the fundamental LINUX operating system and utilities	a,e	2
CO2	apply shell scripts in order to perform basic shell Programming and analyze the Linux file system	k	3
CO3	Analyze the process concepts and create applications using and signal concepts IPC mechanisms	e,k	3

SYLLABUS:

Linux Utilities-File handling utilities, Security by file permissions, Process utilities ,Disk utilities Text processing utilities, and Backup utilities Sed- scripts, operation, addresses, commands, applications, Awk execution, field and records , scripts, operation, patterns, actions functions using system commands in awk.

Working with Bourne again Shell (bash) responsibilities, here documents , running shell script, Shell as a programming language, shell meta characters, Control structures, arithmetic in shell, examples Interrupt processing, functions, debugging shell scripts.

Files : file Concept , File System Structure, I nodes, File Attributes, File types Library functions ,standard and formatted I/O in C, stream errors Kernel support for files ,System calls, file descriptors, low level file access File structure related system calls (FILE APIS), file and record locking File and directory management-Directory file APIS, Symbolic links and hard links

Process concept, Kernel support for process, process attributes, process creation , waiting for a process, Process termination ,Zombie process, orphan process, Process APIs Introduction to signals, signal generation and handling ,Kernel support for signals, signal function, unreliable signals , reliable signals Kill ,raise, alarm, pause, abort, sleep functions

Introduction to IPC , pipes, FIFOs- Introduction to three types of IPC-message queues, semaphores and shared memory -Kernel support for messages, Unix system V APIs for messages- Client /Server example

Text Books:

Unix and Shell Programming , B. A. Forouzan and R.F Gilberg, Cengage learning
Unix Concept and Applications, 4th edn. Sumitabha dasTMH
Beginning Linux programming 4th edn. N. Matthew , R stones Wrox Wiley India edn.

Reference Books:

Linux system Programming , Robot Love, O;Reilly, SPD
Unix Network Programming , W.R. Stevens , PHI
Unix Internals , U Vahalia , Pearson Educaiton
UnixandshellProgramming,S.G.KochanandP.Word3rdedn.PearsoEdn.

E-COMMERCE

Course Code : 15 EM 30B2 **L-T-P 3-0-0**

Prerequisite: Nil **Credits:** 3

Mapping of Course out comes with student out comes:

CO No.	Course outcome	Mapped SO	BTL
CO1	Analyze various E-Commerce Business Models and Infrastructure	j	2
CO2	Understand the Ethical, Social and Political issues in E-Commerce	f	1
CO3	Analyze Marketing communications and Internet resources for E-Commerce	k	2

SYLLABUS

Electronic Commerce: Revolution. E-Commerce Business models and concepts: The Internet and World Wide Web: E-commerce infrastructure. Building an E-commerce web site, online Security and payment systems, E-Commerce Marketing concepts, , Ethical, Social and Political issues in E-Commerce, Retailing on the Web, Online Service industries, B2B E-Commerce: Supply chain management and collaborative commerce. E-Commerce Marketing communications, Internet Resources for Commerce: Technologies for Web Servers, Internet Applications for commerce, Internet Charges, Internet Access and Architecture, Searching the Internet

Text Books:

1. Kenneth C.Laudon, Carol G.Traver , E-Commerce, (Pearson Education)

Reference Books:

1. Daniel Minoli,Emma Minoli,'Web Commerce Technology Handbook',(TMG)
2. Elias M.Awad'Electronic Commerce'(PHI)

K L University

Department of Electronics and Computer Science Engineering

B.Tech - Program Structure 2016-20 Batch

Semester - I & II

S. No	Code	Course Title	L	T	P	Hours	Credits	S. No	Code	Course Title	L	T	P	Hours	Credits
1	15EN1101	Rudiments of Communication Skills	0	0	4	4	2	1	15EN1202	Interpersonal Communication Skills	0	0	4	4	2
2	15MT1001	Single variable Calculus and matrix algebra	2	2	2	6	4	2	15MT1203	Multivariate Calculus	2	2	2	6	4
3	15ME1001	Mechanics	2	2	2	6	4	3	15PH1001	Engineering Materials	2	2	2	6	4
4	15CY1001	Engineering Chemistry	2	2	2	6	4	4	15CS1001	C Programming & Data Structures-2	2	4	2	8	5

5	15CS1001	C Programming & Data Structures-1	2	4	2	8	5
6	15GN1003	Measurements	0	0	4	4	2
7	15GN1001	Ecology & Environment	2	0	0	2	2
Total						36	23

5	15GN1004	Introduction to Engineering	2	0	2	4	3
6	15GN1002	Human Values	2	0	0	2	2
Total						30	20

Semester - III

S.No	Code	Course Title	L	T	P	Hours	Credits
1	15EN2103	Professional communication skills	0	0	4	4	2
2	15EE1201	Fields & Networks	2	2	2	6	4
3	15CS2002	Object Oriented Programming	2	2	2	6	4
4	15EC1101	Digital System Design	2	2	2	6	4
5	15EC2002	Signal Analysis	2	2	2	6	4
6	15EC2103	Analog Electronic Circuit Design	2	4	2	8	5
Total						36	23

Semester - IV

S.No	Code	Course Title	L	T	P	Hours	Credits
1	15EN2204	Employbility Skills	0	0	4	4	2
2	15CS2003	Discrete Mathematics	2	2	2	6	4
3	15EM2001	Computer Organization & Architecture	2	2	2	6	4
4	15CS2007	Database Systems	2	2	2	6	4
5	15EM2202	Processors & Controllers	2	2	2	6	4
6	15EC2206	Signal Processing	2	2	2	6	4
7		Management Elective-1	3	0	0	3	3
Total						37	25
Industrial Training			0	0	0	0	

Semester - V

S.No	Code	Course Title	L	T	P	Hours	Credits
1	15MT2005	Probability & Stochastic Models	2	2	2	6	4
2	15CS2208	Computer Networks	2	2	2	6	4
3	15CS2206	Operating Systems	2	2	2	6	4

Semester - VI

S.No	Code	Course Title	L	T	P	Hours	Credits
1	15EN3206	Corporate Communication skills	0	0	4	4	2
2	15CS2105	Software Engineering	2	2	2	6	4
3	15EM3206	VLSI Design	2	2	2	6	4

4	15EM3103	Embedded Systems	2	2	2	6	4
5	15ME1002	Engineering Graphics	0	0	0	6	3
6	15EM3105	Internet Programing	2	2	2	6	4
7							
Total						36	23

4	15EM3207	Automata & Compiler Design	2	2	2	6	4
5		Professional Electivie -1	3	0	0	4	3
6	15IE3250	Term Paper	0	0	4	4	2
7		Management Elective-2	3	0	0	3	3
8							
Total						33	19

Semester - VII

S.No	Code	Course Title	L	T	P	Hours	Credits
1		Professional Electivie -2	3	0	0	4	3
2		Professional Electivie -3	3	0	0	4	3
3		Professional Electivie -4	3	0	0	4	3
4		Professional Electivie-5	3	0	0	4	3
5	15EM3104	Communication Systems	2	2	2	6	4
6	15IE4049	Minor Project	0	0	4	4	2
7	15EN3105	Verbal & Quantitative Reasoning	0	0	4	4	2
8							
Total						30	20

Semester - VIII

S.No	Code	Course Title	L	T	P	Hours	Credits
1		Open Elective - 2	3	0	0	3	3
2		Open Elective - 3	3	0	0	3	3
3	15IE4050	Major Project	0	0	16	16	8
		Foreign Language	3	0	0	2	3
Total						24	17

	Credits
Semester - I	23
Semester - II	20
Semester - III	23
Semester - IV	22
Semester - V	23
Semester - VI	23
Semester - VII	20
Semester - VIII	17
Total	**171**