INSTITUTE VISION

To emerge as a Centre of Excellence for Learning and Research in the domains of engineering, computing and management.

INSTITUTE MISSION

- Provide congenial academic ambience with state-art of resources for learning and research.
- Ignite the students to acquire self-reliance in the latest technologies.
- Unleash and encourage the innate potential and creativity of students.
- Inculcate confidence to face and experience new challenges.
- Foster enterprising spirit among students.
- Work collaboratively with technical Institutes / Universities / Industries of National and International repute

DEPARTMENT VISION

To become a centre of excellence in Electronics and Communication Engineering and provide necessary skills to the students to meet the challenges of industry and society.

DEPARTMENT MISSION

- Provide congenial academic ambience with necessary infrastructure and learning resources
- Inculcate confidence to face and experience new challenges from industry and society.
- Ignite the students to acquire self-reliance in State-of-the-Art Technologies
- Foster Enterprising spirit among students

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After few years of graduation the, graduates of Electronics and Communication Engineering shall

PEO1: Have Professional competency through the application of knowledge gained from subjects like Mathematics, Physics, Chemistry, Inter-Disciplinary and core subjects like Signal Processing, VLSI, Embedded Systems, Communication and Automation.**(Professional Competency)**

PEO2: E*xcel* in one's career by critical thinking towards successful services and growth of the organization or as an entrepreneur or through higher studies. **(Successful Career Goals)**

PEO3: Enhance knowledge by updating advanced technological concepts for facing the rapidly changing world and contribute to society through innovation and creativit*y*. **(Continuing Education and Contribution to Society)**

PROGRAMME OUTCOMES (PO's)

On Successful completion, the graduate will be able to,

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's)

On Successful completion, the graduate will be able to,

PSO1: Apply the knowledge obtained in core areas for the analysis and design of components in Signal Processing, VLSI, Embedded Systems, Communication and Automation.

PSO2: Adapt Innovation, Creativity and design to develop products which meet industrial and societal needs.

ACADEMIC REGULATIONS FOR B. TECH (REGULAR-FULL TIME)
(Effective for the students admitted into I year from the Academic Year 2018-2019 onwards)

1. ELIGIBILITY FOR ADMISSION

Admission of the B.Tech program shall be made subjects to the eligibility qualifications and Specialization prescribed by the University for each Program from time to time. Admission shall be made either on the basis of Merit/ Rank Obtained by the Qualifying candidates in EAMCET/ECET or otherwise specified whichever is relevant.

2. AWARD OF B.TECH. DEGREE

A student will be declared eligible for the award of the B.Tech. Degree if he/she fulfils the following academic regulations:

i. Pursues a course of study for not less than four academic years and in not more than eight academic years.
ii. For Lateral entry students, shall pursue a course of study for not less than three academic years and in not more than six academic years.
iii. Registers for 160 credits and secure all 160 credits.
iv. Lateral entry students shall register for 126 credits and secure all 126 credits

3. ACADEMIC REQUIREMENTS

Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years (for Regular Entry) / Six academic years (for Lateral entry) from the year of their admission, shall forfeit their seat in B.Tech. Course and their admission stands cancelled.

4. CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Humanities and Social Science (HS), Basic Sciences (BS), Engineering Science (ES), Professional Core (PC), Core Elective (CE), Open Elective (OE), Project Work (PW), Audit Course (AC), On-line Comprehensive Test (OCT).

4.1. SUBJECT COURSE CLASSIFICATION

All subjects/ courses offered for the under graduate programme in B.Tech. degree programmes are broadly classified as follows. The Institution has followed almost all the guidelines issued by AICTE/UGC.

S.No	Broad Course Classification	Course Group Category	Course Description
1	Foundation Courses	BS - Basic Sciences	Includes mathematics, physics and chemistry subjects
		ES - Engineering Sciences	Includes fundamental engineering subjects
		HS - Humanities and Social Sciences	Includes subjects related to humanities, social sciences and management
2	Core Courses	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
3	Elective Courses	CE - Core Electives	Includes electives subjects related to the parent discipline department branch of engineering
		OE - Open Electives	Elective subjects which include inter disciplinary subjects or subjects in an area outside the parent discipline department branch of engineering
		MOOC – Electives	Online courses which include inter disciplinary subjects or subjects in an area outside the parent discipline department
4	Employability Enhancement Courses	Project Work	B.Tech major project work
		On-line Comprehensive Test	Comprehensive Exams (with one credit)
		Industrial training	Industrial Internship or Industrial visit or Industrial training (non Credit)
		Reasoning and Aptitude	Courses which includes mathematical analysis to understand and Solve the real life problems. (non Credit)
5	Minor Courses	Communication and Soft SkillsLab	Courses which includes improve the communication skills and personality development (with one credit)
6	Audit Course	1.Constitution of India 2.Environmental sciences 3.Professional Ethics	Mandatory Courses (non Credit)

5. INDUCTION PROGRAM FORI - B.TECH

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days. We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature. The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following (Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Familiarization to Department / Branch & Innovations, Basic Science and Foundation of Mathematics) are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

6.CONTACT HOURS

Depending on the complexity and volume of the course, the number of contact hours per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours / week as follows.

- Contact classes (Theory): 1 credit per lecture hour per week.
- Laboratory Hours (Practical): 1 credit for 2 Practical hours, per week.
- Project Work: 1 credit for 2 hours of project work per week

6.1 DEFINITION OF CREDIT

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical (Lab)/week	1 credit

7. SUPPLEMENTARY EXAMINATIONS

The student eligible to appear the supplementary external examinations if he was absent for it or failed in it or not registered. However, IV-II semester students there will be an advanced Supplementary Examinations.

8. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, project work shall be evaluated for100 marks whereas audit courses shall be evaluated for a maximum of 30 internal marks.

i. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

ii. For practical subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.

8.1 Internal Examinations

For theory subjects, during the semester, there shall be two mid-term examinations. Each mid-term examination consists of objective paper for 10 marks and subjective paper for 15 marks with duration of 1hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper). However 5 marks are awarded for 5 assignments (unit-wise). Assignments one & two are collected from the students before I mid-term examinations and assignments three, four and five are collected from the students before II mid-term examinations for every theory subjects.

Objective paper shall be for 10 marks. Subjective paper shall contain 5 questions of which student have to answer 3 questions for 15 marks.

Note 1: The subjective paper shall contain 5 questions of equal Weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 15 marks; any fraction shall be rounded off to the next higher mark.

Note 2: The midterm examination shall be conducted first by distribution of the Objective paper, simultaneously marking the attendance, after 20 minutes the answered objective paper shall be collected back. The student is not allowed to leave the examination hall. Then the descriptive question paper and the answer booklet shall be distributed. After 90minutes the answered booklets are collected back.

If the student is absent for the internal examination, no re-exam or make up shall be conducted and internal marks for that examination shall be considered as zero.

First midterm examination shall be conducted for I& II units of syllabus and second midterm examination shall be conducted for III, IV & V units.

Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other

For Ex:

Marks obtained in first mid : 20

Marks obtained in Second mid : 20

Internal Marks: (20x0.8) + (20x0.2) : 20

Final internal marks= Internal Marks+ Assignment marks

If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 80% Weightage to the marks secured by the student in the appeared examination and zero to the other.

For Ex:

Marks obtained in first mid : Absent Marks obtained in Second mid: 20

Internal Marks : (20x0.8)+ (0x0.2) =16

Final internal marks= Internal Marks+ Assignment marks

8.2 END EXAMINATIONS

8.2.1 End examinations (Theory subjects)

(i). End examination of theory subjects shall have the following pattern:

a. There shall be two parts, Part-A and Part-B.

b. Part-A shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit.

c. Part-B Shall be either-or type questions of 10 marks each. Student shall answer any one of them.

d. Each of these questions from Part-B shall cover one unit of the syllabus.

(ii). End examination of theory subjects consisting of two parts of different subjects, for ex: Electrical & Mechanical Technology, shall have the following pattern:

a. Question paper shall be in two parts viz., Part A and Part B with equal Weightage

b. In each part, there shall be 3 either-or type questions for 12, 12 and 11 marks.

Note: The answers for Part A& Part B shall be written in two separate answer books.

8.2.2 End examinations (Practical subjects)

For practical subjects there shall be a 30 sessional marks (15 marks allotted for internal practical examination to be conducted before the last working day and 15 marks for Day-to-day work in the laboratory shall be evaluated by the concerned laboratory teacher based on the regularity / record / viva-voce) and end examination shall be for 70 marks.

The end examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department.

In a practical subject consisting of two parts (ex: Engineering Workshop & IT Workshop), the end examination shall be conducted for 35 marks in each part. Internal examination shall be evaluated as above for 30 marks in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

8.2.3 Drawing Courses

For the subject having design and/or drawing, such as Engineering Drawing / Graphics, the distribution shall be 30 marks for internal evaluation and 70 marks for end examination.

All the drawing related courses are evaluated in line with laboratory courses. The distribution shall be 30 marks for internal evaluation (15 marks for day to day evaluation (unit wise chart work) and 15 marks for unit-wise assignments) and 70 marks for semester end examinations.

There shall be two midterm examinations in a semester for duration of 2hrs each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 15 marks, any fraction shall be rounded off to the next higher mark. There shall be no objective paper in internal examination. The sum of day to day evaluation with assignments and the internal test marks will be the final sessional marks for the subject.

In the end examination pattern for Engineering Drawing / Graphics there shall be 5 questions, either-or type, of 14 marks each. There shall be no objective / short answer type questions in the end examination.

8.2.4 Audit courses

There shall three audit pass courses in Constitution of India, Environmental Science and Professional Ethics with no credits. There shall be no external examination. However, attendance in the audit course shall be considered while calculating aggregate attendance and student shall be declared pass in the audit course only when he / she secures 40% or more in the internal examinations. In case if student fails, re-exam shall be conducted for failed candidates every six months / semester at a mutual convenient date of college / student satisfying the conditions mentioned in item 1 of the regulations.

8.2.5 On-line Comprehensive Test (OCT)

There shall be two On-line comprehensive Tests, one at the end of the II year II semester and the other at the end of III year – II semester, with 100 objective questions for 100 marks on the subjects studied in the respective semesters. The Controller of Examination is given responsibility of preparing question bank / question paper conducting online examination maintains confidentiality. A student shall acquire one credit assigned to the On-line Comprehensive Test only when he / she secure 40% or more marks. In case, if a student fails in On-line Comprehensive Test, he / she shall reappear at the next supplementary examination when offered.

8.2.6 Massive Online Open Course's (MOOC'S)

The college in line with the developments in Learning Management Systems (LMS) intends to encourage the students to do online courses in MOOCs, offered nationally / internationally. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion of the course from the MOOCs providers. Institution intends to encourage the students to do one MOOC in III year II Semester of the B.Tech. Programme. The respective departments shall give a list of standard MOOCs providers among NPTEL, edx, Udacity, Coursera, or any other standard providers, whose credentials are endorsed by the HoD. Each department shall appoint Coordinators / Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same. A student shall choose an online course (relevant to his / her programme of study) from the given list of MOOCS providers, as endorsed by the teacher concerned, with the approval of the HOD.

Students may be permitted to register one online course (which is provided with certificate) in 3rd year 1st semester and they should produce the course completion certificate of that course to the controller of Examination to become eligible for fulfilment of the degree.

9. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS, also called as Open Electives (OEs) will be implemented in the college. The CBCS provides choice for students to select from the prescribed courses. In which students can take courses of their choice, learn at their own pace and adopt an interdisciplinary approach to learning. It is mandatory for Under Graduate (UG) students to study 2 CBCS courses. The students have to choose one open elective (OE -I) in III year IIsemester, and one (OE-II) in IV year I semester, from the list of open electives given.

However, the student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

10. CORE ELECTIVES

Students have to choose core electives (CE-I and CE-II) in IV year I semester and core electives (CE-III and IV) in IV year II semester, from the list of core electives courses given. However, the students may opt for core elective subjects offered in the related area.

11. VALUE ADDED COURSES (VAC)

Every student to undergo one Value Added Course (VAC) per semester from second year first semester (II-I) to fourth year fourth year first semester (IV-I). The details of the syllabus, time table and faculty may be sent to the Controller of Examinations after approval from the Head of the Institution concerned at-least one month before the course is offered. Students can take a minimum of 30 lectures / Practices / Training session per course.

12. INDUSTRIAL VISIT

Industrial Visit for every student is required to go for at least one Industrial Visit starting from the second year of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

13. INDUSTRIAL TRAINING / INDUSTRIAL INTERNSHIP

Industrial Training / Industrial Internship for every student is required to go for at least one Industrial Training / Industrial Internship starting from the third year of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

14. PRESERVATION OF RECORDS

The laboratory records, internal test papers and end examination answer booklets shall be preserved for minimum of 2 years in the institution.

15. ATTENDANCE REQUIREMENTS

15.1 A student shall be eligible to appear for University examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

15.2 Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

15.3 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

15.4 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

15.5 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.

15.6 A stipulated fee shall be payable towards Condonation of shortage of attendance to the College.

16. MINIMUM ACADEMIC REQUIREMENTS (Regular Students)

The following academic requirements have to be satisfied in addition to the attendance requirements.

16.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subjects or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In case of audit courses he/she should secure 40% of the total marks.

16.2 A student shall be promoted from II to III year only if he / she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to II year II semester from the following examinations, if any fraction shall be rounded off to the next higher credit.

For I/I semone regular and two supplementary examinations

For I/II sem one regular and one supplementary examinations.

For II/I sem one regular examinations.

For II/II sem one regular examinations.

16.3 A student shall be promoted from III year to IV year only if he / she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to III year II semester from the following examinations, if any fraction shall be rounded off to the next higher mark.

For I/I sem one regular and four supplementary examinations.

For I/II sem one regular and three supplementary examinations.

For II/I sem one regular and two supplementary examinations.

For II/II sem one regular and one supplementary examinations.

For III/I sem one regular examinations.

For III/II sem one regular examinations.

And in case if student is already detained for want of credits for particular academic year by sections 16.2 and 16.3 above, the student may make up the credits through supplementary exams of the above exams before the commencement of third or fourth year I semester class work respectively of next year.

17. MINIMUM ACADEMIC REQUIREMENTS (For Later Entry Students)

The Following academic requirements have to be satisfied in addition to the attendance requirements.

17.1 A students shall be deemed to have satisfied them minimum academic requirements and earned the credits allotted to each theory practical, design drawing subjects or projects if he secures not less than 35% of marks in the end examinations and a minimum of 40 % of marks in the sum total of the internal evaluation and examination taken together. In the Seminar he/she should secure 40 %

17.2 A Student shall be promoted from III year to IV year only if he / she fulfils the academic requirements of securing 40% credits of the subjects that have been studied up to III year II semester (if any fraction shall be rounded off to the next higher credit) from

For II/I sem one regular and two supplementary examinations.

For II/II sem one regular and one supplementary examinations.

For III/I sem one regular examinations.

For III/II sem one regular examinations.

In case if student is already detained for want of credits for particular academic year by sections 16.2 and 16.3 above, the student may make up the credits through supplementary exams of the above exams before the commencement of third or fourth year I semester class work respectively of next year.

17.3 A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits. Marks obtained in all 160 credits shall be considered for the calculation of aggregate percentage of marks obtained.

18. COURSE PATTERN

18.1 The entire course of study is for four academic years. All years shall be on semester pattern.

18.2 A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.

18.3 When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he / she shall be in the academic regulations into which he / she is readmitted.

19. WITH–HOLDING OF RESULTS:

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

20. GRADING

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Table – Conversion into Grades and Grade Points assigned

Range in which the Marks In the Subject Fall	**Grade**	**Grade Points** Assigned
≥ 90	S	10
80-89	A	9
70-79	B	8
60-69	C	7
50-59	D	6
40-49	E	5
< 40	F (Fail)	0
Absent	Abs (Absent)	0

i. A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.

ii. For non credit courses “Pass” shall be indicated instead of the letter ‘P’ and this will not be counted for the computation of SGPA/CGPA.

20.1. SEMESTER GRADE POINT AVERAGE (SGPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA):

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$SGPA = \Sigma (Ci \times Gi) / \Sigma Ci$

Where, Ci is the number of credits of the ith subject and Gi is the grade point scored by the student in the ith course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$CGPA = \Sigma (Ci \times Si) / \Sigma Ci$

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. SGPA will be given to those who cleared all the subjects in that semester

v. GRADE POINT: It is a numerical weight allotted to each letter grade on a 10-point scale.

vi. LETTER GRADE: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

21. AWARD OF CLASS:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

22. TRANSITORY REGULATIONS

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having

undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will be in the academic regulations into which they get readmitted.

Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B.Tech from the date of commencement of class work, subject to Section 2 and they will be in the academic regulations into which the candidate is presently rejoining.

23. MINIMUM INSTRUCTION DAYS:

The minimum instruction days including exams for each semester shall be 90 days.

24. REVALUATION

A candidate can apply for revaluation of his / her end examination answer paper in a theory courses. The examination section shall issue a notification inviting applications for the revaluation after publishing the results. The application forms can be obtained from the examination section. A candidate can apply for revaluation of answer scripts in not more than 5subjects at a time.

No revaluation for comprehensive Examination, practical and project work.

25. CONDUCT AND DISCIPLINE

(i) Students shall conduct themselves within and outside the precincts of the Institute in a manner befitting the students of an Institute of National importance

(ii) As per the order of the Hon'ble Supreme Court of India, ragging in any form is banned: acts of ragging will be considered as gross indiscipline and will be severely dealt with.

(iii) The following additional acts of omission and /or commission by the students within or outside the precincts of the college shall constitute gross violation of code of conduct and are liable to invoke disciplinary measures

(a) Ragging

(b) Lack of courtesy and decorum: indecent behaviour anywhere within or outside the campus.

(c) Wilful damages or stealthy removal of any property /belongings of the Institute / Hostel or of fellow students

(d) Possession, consumption of distribution of alcoholic drinks or any kind of hallucinogenic drugs

(e) Mutilation or unauthorized possession of library books

(f) Hacking in computer systems

(g) Furnishing false statements to the disciplinary committee, or willfully withholding information relevant to an enquiry

(h) Organizing or participation in any activity that has potential for driving fellow students along lines of religion caste batch of admission hostel or any other unhealthy criterion .

(i) Resorting to noisy and unseemly behavior, disturbing studies of fellow students

(j) Physical or mental harassment of fresher through physical contact or oral abuse

(k) Adoption of unfair means in the examination

(l) Organizing or participating in any group activity except purely academic and scientific Programmers in company with others in or outside campus without prior permission of the Principal

(m) Disturbing in drunken state or otherwise an incident in academic or students function or any other public event.

(n) Not obeying traffic rules in campus not following safety practices or causing potential danger to oneself or other persons in any way.

(o) Any other act or gross indiscipline

(iv). Commensurate with the gravity of the offence the punishment may be reprimand fine and expulsion from the hostel debarment from an examination rustication for a specified period or even outright expulsion from the College

(v). The reprimanding Authority for an offence committed by students in the Hostel and in the Department or the classroom shall be respectively, the managers of the Hostels and the Head of the concerned Department

(vi). In all the cases of offence committed by students in jurisdictions outside the purview of clause (19.v) the Principal shall be the Authority to reprimand them.

(vii). All Major acts of indiscipline involving punishment other than mere reprimand shall be considered and decided by the Principal Students Disciplinary Committee appointed by the Principal

(viii) All other cases of Indiscipline of Students like adoption of unfair means in the examinations shall be reported to the Vice-Principal for taking appropriate action and deciding on the punishment to be levied.

(ix) In all the cases of punishment levied on the students for any offence committed the aggrieved party shall have the right to appeal to the Principal who shall constitute appropriate Committees to review the case.

26. TRANSFER DETAILS

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

27. GENERAL

27.1 The academic regulations should be read as a whole for purpose of any interpretation.

27.2 Malpractices rules- nature and punishments are appended.

27.3 Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.

27.4 The college may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the college.

NATURE OF MALPRACTICES/ IMPROPER CONDUCT PUNISHMENT	PUNISHMENT
1. (a) possesses or keeps access in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory/ practical) in which he/she is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) Expulsion from the examination hall and cancellation of the performance in that subject only.	Expulsion from the examination hall and cancellation of the performance in that subject Only.
1. (b) Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates	Expulsion from the examinations hall and cancellation of the performance in that subject only of all the candidates involved in case of an

through cell phones with any candidate or persons inside or outside the exam hall in respect of any matter. Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he/she will be handed over to the police and a case is registered against him/her.	outsider He / She will be handed over to the police and a case is registered against him/her.
2. Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examinations hall and cancellation of the performance in that subject and all other subjects the candidates has already appeared including practical examinations and projects work and shall not be permitted to appear for the reaming examinations of the subjects of that semester/Year The Hall Ticket of the candidate will be cancelled and retained by the CE.
3. Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
4. Smuggles in the answer book or additional	If the imposter is an outsider, he/she will be

sheet or takes out or arranges to send out the question paper or answer book or additional sheet, during or after the examination.	handed over to the police and a case is registered against him/her. Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5. Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6. Refuses to obey the orders of the Chief Superintendent/Assistant-Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall or causes any injury to his person or to any of his relatives whether by offensive words spoken or written or by signs or by visible representation or assaults the officer-in-charge, or any person on duty inside or outside the examination hall or any of his relatives, or indulges in any other act of misconduct or mischief which results in damage	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates are also debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7. Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all the external examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8. Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9. Belongs to college, who is not a candidate for the particular examination or any person not connected with the college but indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college will be expelled from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that

	semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10. Comes in a drunken state to the examination hall.	Expulsion from the examination hall and cancellation of the performance.
11. Copying is detected on the basis of internal evidence, such as, during valuation or during special scrutiny	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12. If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award suitable punishment.	

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CURRICULUM AND SYLLABUS – 2018

I B.Tech. I Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18SAH111	Communicative English	HS	2	-	-	2	30	70	100
2	18SAH113	Engineering Chemistry	BS	2	1	-	3	30	70	100
3	18SAH114	Engineering Mathematics - I	BS	2	1	-	3	30	70	100
4	18CSE111	Computer Programming	ES	2	1	-	3	30	70	100
5	18EEE121	Basic Electrical circuits	ES	2	1		3	30	70	100
6	18SAH116	Engineering Chemistry Lab	BS	-	-	2	1	30	70	100
7	18CSE112	Computer programming lab	ES	-	-	2	1	30	70	100
8	18EEE122	Basic Electrical circuits lab	ES	-	-	2	1	30	70	100
Contact hours per week				10	4	6	-	-	-	-
Total hours per week				20			-	-	-	-
Total credits (5 Theory + 3 Labs)							17	-	-	-
Total Marks								240	560	800

I B.Tech. II Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18SAH121	Technical English	HS	2	-	-	2	30	70	100
2	18SAH122	Engineering Mathematics - II	BS	2	1	-	3	30	70	100
3	18SAH112	Engineering Physics	BS	2	1	-	3	30	70	100
4	18MEC111	Engineering Graphics	ES	1	-	4	3	30	70	100
5	18CSE121	Problem Solving using Python Programming	ES	2	1	-	3	30	70	100
6	18SAH115	Engineering Physics Lab	BS	-	-	2	1	30	70	100
7	18CSE122	Problem Solving using Python Programming Lab	ES	-	-	2	1	30	70	100
8	18MEC112	Engineering Workshop and IT Workshop	ES	-	-	2	1	30	70	100
Contact hours per week				9	3	10	-	-	-	-
Total hours per week				22			-	-	-	-
Total credits (5 Theory + 3 Labs)							17	-	-	-
Total Marks								240	560	800

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II B.Tech. I Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18SAH211	Engineering Mathematics -III	BS	2	1	-	3	30	70	100
2	18MBA212	Business Management	HS	3	-	-	3	30	70	100
3	18EEE214	Principles Of Electrical Engineering	ES	2	1	-	3	30	70	100
4	18ECE211	Electronic Devices & Circuits	PC	2	1	-	3	30	70	100
5	18ECE212	Signals &Systems	PC	2	1	-	3	30	70	100
6	18ECE213	Switching Theory And Logic Design	PC	2	1	0	3	30	70	100
7	18ECE214	Electronic Devices And Circuits Lab	PC	-	-	2	1	30	70	100
8	18EEE215	Principles Of Electrical Engineering Lab	ES	-	-	2	1	30	70	100
9	18AUD212	Environmental Science	AC	2	-	-	-	-	-	-
10	18SAH212	Reasoning and Aptitude-I	HS	2	-	-	-	-	-	-
Contact hours per week				17	5	4	-	-	-	-
Total hours per week				26			-	-	-	-
Total credits (6 Theory + 2 Labs)							20	-	-	-
Total Marks								240	560	800

II B.Tech II Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18SAH221	Engineering Mathematics IV	BS	2	1	-	3	30	70	100
2	18ECE221	Electronic Circuit Analysis	PC	2	1	-	3	30	70	100
3	18ECE222	Pulse And Digital Circuits	PC	2	1	-	3	30	70	100
4	18ECE223	Probability Theory & Stochastic Process	PC	2	1	-	3	30	70	100
5	18ECE224	Electromagnetic Fields and Waves	PC	2	1	-	3	30	70	100
6	18ECE225	Computer Architecture	PC	3	-	-	3	30	70	100
7	18ECE226	Electronic Circuit Analysis Lab	PC	-	-	2	1	30	70	100
8	18ECE227	Pulse & Digital Circuits Lab	PC	-	-	2	1	30	70	100
9	18ECE228	Online Comprehensive Test-I	PC	2	-	-	1	-	100	100
10	18AUD211	Constitution of India	AC	2	-	-	-	-	-	-
11	18SAH223	Reasoning and Aptitude-II	HS	2	-	-	-	-	-	-
Contact hours per week				19	5	4	-	-	-	-
Total hours per week				28			-	-	-	-
Total credits (6 Theory + 2 Labs)							21	-	-	-
Total Marks								240	660	900

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III B.Tech. I Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE311	Analog Communications	PC	2	1	-	3	30	70	100
2	18ECE312	Linear And Digital IC Applications	PC	2	1	-	3	30	70	100
3	18ECE313	VLSI Design	PC	2	1-	-	3	30	70	100
4	18ECE314	Advanced Microprocessor and Microcontrollers	PC	2	1	-	3	30	70	100
5	18ECE315	Transmission Lines and Waveguides	PC	2	1	-	3	30	70	100
6	18EEE313	Control Systems	ES	2	1	-	3	30	70	100
7	18ECE316	IC Applications Lab	PC	-	-	2	1	30	70	100
8	18ECE317	Advanced Microprocessor and Microcontrollers Lab	PC	-	-	2	1	30	70	100
9	18SAH311	Communication and Soft Skills Lab	HS	-	-	2	1	30	70	100
10	MOOC	Massive Online Open Course	MC	-	-	-	-	-	-	-
Contact hours per week				12	6	6	-	-	-	-
Total hours per week				24			-	-	-	-
Total credits (6 Theory + 3 Labs)							21	-	-	-
Total Marks								270	630	900

III B.Tech. II Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE321	Digital Communications	PC	2	1	-	3	30	70	100
2	18ECE322	Antenna Wave Propagation	PC	2	1	-	3	30	70	100
3	18ECE323	Digital Signal Processing	PC	2	1	-	3	30	70	100
4	18ECE324	Digital Design through Verilog HDL	PC	2	1	-	3	30	70	100
5	18ECE325	Electronic Measurements and Instrumentation	PC	3	-	-	3	30	70	100
6	OE-I	**Open Elective-I**	OE	3	-	-	3	30	70	100
7	18ECE326	Analog &Digital Communications Lab	PC	-	-	2	1	30	70	100
8	18ECE327	Digital Design through Verilog HDL lab	PC	-	-	2	1	30	70	100
9	18ECE328	Project Skills Lab	PW		-	2	1	30	70	100
10	18ECE329	On-line Comprehensive Test-II	PC	2	-	-	1	-	100	100
Contact hours per week				16	4	6	-	-	-	-
Total hours per week				26			-	-	-	-
Total credits (6 Theory + 3 Labs)							22	-	-	-
Total Marks								270	730	1000

IV B.Tech. I Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE411	Microwave &Optical Communications	PC	2	1	-	3	30	70	100
2	18ECE412	Digital Image Processing	PC	2	1	-	3	30	70	100
3	18ECE413	Micro Electro Mechanical Systems	PC	2	1	-	3	30	70	100
4	18ECE414	**Core Elective-I**	CE	3	-	-	3	30	70	100
5	18ECE415	**Core Elective-II**	CE	3	-	-	3	30	70	100
6	OE-II	**Open Elective-II**	OE	3	-	-	3	30	70	100
7	18ECE416	Microwave &Optical Communications Lab	PC	-	-	2	1	30	70	100
8	18ECE417	Digital Signal& Image Processing Lab	PC	-	-	2	1	30	70	100
9	18AUD411	Professional Ethics	AC	2	-	-	-	-	-	-
Contact hours per week				17	3	4	-	-	-	-
Total hours per week				24			-	-	-	-
Total credits (6 Theory + 2 Labs)							20	-	-	-
Total Marks								240	560	800

IV.B.Tech. II Semester.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE421	Satellite & Radar Communications	PC	2	1	-	3	30	70	100
2	18ECE422	Artificial Intelligence	PC	2	1	-	3	30	70	100
3	18ECE423	**Core Elective-III**	CE	3	-	-	3	30	70	100
4	18ECE424	**Core Elective-IV**	CE	3	-	-	3	30	70	100
5	18ECE425	Project Work	PW	-	-	20	10	30	70	100
Contact hours per week				10	2	20	-	-	-	-
Total hours per week				32			-	-	-	-
Total credits (4 Theory + 1Project Work)							22	-	-	-
Total Marks								150	350	500

CORE ELECTIVES

IV B.Tech. I Semester. (Core Elective-I)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE414A	Computer Networks	CE	3	-	-	3	30	70	100
2	18ECE414B	Cellular Mobile communications	CE	3	-	-	3	30	70	100
3	18ECE414C	Advanced Digital Signal Processing	CE	3	-	-	3	30	70	100
4	18ECE414D	Parallel & Distributed Computing	CE	3	-	-	3	30	70	100
5	18ECE414E	Fundamentals of Nano electronics	CE	3	-	-	3	30	70	100

IV B.Tech. I Semester. (Core Elective-II)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE415A	FPGA Design	CE	3	-	-	3	30	70	100
2	18ECE415B	Robotics and Automation	CE	3	-	-	3	30	70	100
3	18ECE415C	Medical Electronics	CE	3	-	-	3	30	70	100
4	18ECE415D	Wireless Communications Network	CE	3	-	-	3	30	70	100
5	18ECE415E	Television Engineering	CE	3	-	-	3	30	70	100

IV B.Tech. II Semester. (Core Elective-III)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE423A	Advanced Computer Architecture	CE	3	-	-	3	30	70	100
2	18ECE423B	Pattern recognition	CE	3	-	-	3	30	70	100
3	18ECE423C	RF Integrated circuits	CE	3	-	-	3	30	70	100
4	18ECE423D	Cyber Security	CE	3	-	-	3	30	70	100
5	18ECE423E	Multimedia Compression and network	CE	3	-	-	3	30	70	100

IV B.Tech. II Semester. (Core Elective-IV)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18ECE424A	Embedded Real Time Operating Systems	CE	3	-	-	3	30	70	100
2	18ECE424B	Artificial Neural Network	CE	3	-	-	3	30	70	100
3	18ECE424C	Bio Medical Instrumentation	CE	3	-	-	3	30	70	100
4	18ECE424D	Low power VLSI Design	CE	3	-	-	3	30	70	100
5.	18ECE424E	Sensors and Transducers	CE	3	-	-	3	30	70	100

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OPEN ELECTIVE-I

III B.Tech. II Semester.

Offered Department	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
S&H	18OSAH321	Mathematical Modelling-Analysis and Applications	OE	3	1	-	3	30	70	100
	18OSAH322	Business Communication and Career Skills	OE	3	-	-	3	30	70	100
	18OSAH323	Laser and Fiber Optics	OE	3	1	-	3	30	70	100
CSE	18OCSE321	Object Oriented Programming	OE	3	-	-	3	30	70	100
	18OCSE322	Operating Systems	OE	3	-	-	3	30	70	100
	18OCSE323	Web Programming	OE	3	-	-	3	30	70	100
CIV	18OCIV321	Construction and Project Management	OE	2	1	-	3	30	70	100
	18OCIV322	Remote Sensing and GIS	OE	3	-	-	3	30	70	100
	18OCIV323	Green Buildings and Energy Conservation	OE	3	-	-	3	30	70	100
EEE	18OEEE321	SCADA System and Applications	OE	3	-	-	3	30	70	100
	18OEEE322	Servicing of Electrical Appliances	OE	3	-	-	3	30	70	100
	18OEEE323	Power System Reforms	OE	3	-	-	3	30	70	100
MECH	18OMEC321	Industrial Robotics	OE	3	-	-	3	30	70	100
	18OMEC322	Power Plant Technology	OE	3	-	-	3	30	70	100
	18OMEC323	Mechatronics System	OE	3	-	-	3	30	70	100

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OPEN ELECTIVE-II

IV B.Tech. I Semester.

Offered Department	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
S&H	18OSAH411	Graph theory with Applications	OE	3	1	-	3	30	70	100
	18OSAH412	Managing Innovation and Entrepreneurship	OE	3	-	-	3	30	70	100
	18OSAH413	Intellectual Property Rights	OE	3	-	-	3	30	70	100
CSE	18OCSE411	Fundamentals of DBMS	OE	3	-	-	3	30	70	100
	18OCSE412	Basics of Internet of Things	OE	3	-	-	3	30	70	100
	18OCSE413	Information Security	OE	3	-	-	3	30	70	100
CIV	18OCIV411	Transport and Environment	OE	3	-	-	3	30	70	100
	18OCIV412	Disaster Management	OE	3	-	-	3	30	70	100
	18OCIV413	Air Pollution and Control Engineering	OE	3	-	-	3	30	70	100
EEE	18OEEE411	Wind Energy conversion System	OE	3	-	-	3	30	70	100
	18OEEE412	Fundamentals of Energy Auditing	OE	3	-	-	3	30	70	100
	18OEEE413	Introduction to Power Quality	OE	3	-	-	3	30	70	100
MECH	18OMEC411	Quality Control Reliability Engineering	OE	3	-	-	3	30	70	100
	18OMEC412	Industrial Engineering and Psychology	OE	3	-	-	3	30	70	100
	18OMEC413	3D Printing and Design	OE	3	-	-	3	30	70	100

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SUMMARY OF CREDIT ALLOCATION

S.NO	SUBJECT AREA	CREDITS AS PER SEMESTER								TOTAL CREDITS
		I-I	I-II	II-I	II-II	III-I	III-II	IV-I	IV-II	
1.	HS	2	2	3	0	1				8
2.	BS	7	7	3	3	0				20
3.	ES	8	8	4	0	3				23
4.	PC			10	18	17	18	11	6	80
5.	CE							6	6	12
6.	OE						3	3		6
7.	PW						1		10	11
Total		17	17	20	21	21	22	20	22	160

Note: HS- Humanities and Social Science; BS- Basic Sciences; ES – Engineering Science; PC – Professional Core; CE- Core Elective; OE- Open Elective; PW - Project Work; AC – Audit Course.

PERCENTAGE –WISE CREDIT DISTRIBUTION

S.No	Category	Credits Allocated	Percentage –wise Credit Distribution
1	HS- Humanities and Social Sciences	8	5%
2	ES – Engineering Science	23	14.37 %
3	BS – Basic Sciences	20	12.5%
4	PC – Professional Core	80	50%
5	CE- Core Elective	12	7.5%
6	OE- Open Elective	6	3.75%
7	PW – Project Work	11	6.87%
Total		**160**	**100**

I B.Tech I Semester

		L	T	P/D	C
18SAH111	**COMMUNICATIVE ENGLISH**				
	(Common to all Branches)	2	-	-	2

Course Educational Objectives:

1. To Provide Knowledge on Behavioural aspects, developing vocabulary by deriving various ways of forming words.

2. To cultivate Individual and Team Work skills, Knowledge on the usage of foreign language words in to English Language,

3. To Cultivate Adaptability Skills in work place, Knowledge on Grammatical aspects of Verbs and Adverbs, words by applying stress, how to express one's opinions and dialogue writing.

4. Acquiring of Entrepreneurship Skills, Usage of grammar aspects of Prepositions, Pronunciation of suffix words, and acquisition of writing skills.

5. Contextual knowledge to recognize the need of ability to engage in independent and life-long learning in the broadest context of technological change.

UNIT-1 **(9Hr)**

"ISWARAN" (A Story from R.K. Narayan's Malgudi Days) - Word Formation: Clipping- Acronym- Blending- Back-formation- Derivation - Borrowing – Coinage- Compounding - Nouns-Kinds and Uses - Pronouns-Kinds and uses - Listening to Vowel Sounds - Introducing self and others - Reading Comprehension.

UNIT-2 **(9Hr)**

"WHITE WASHING THE FENSE" (Team work skills by Mark Twain) - A-Z Root words from foreign languages and their use in English – Adjectives - Degrees of Comparison - Listening to Consonant Sounds – Greetings - Reading Strategies - Sentence Structures and formation.

UNIT-3 **(9Hr)**

"SENOR PAYROLL" (Adaptability skills by William E. Barrett) - Verbs-Forms - List of Regular and Irregular verbs-Be verbs-Gerunds - Adverbs-types and formation of adverbs - Listening to Word Stress - Expressing opinions – Paraphrasing -Dialogue Writing.

UNIT-4 **(9Hr)**

"ACQUISITION OF ENTREPRENEURSHIP SKILLS" (a brief biography of AZIM PREMJI) – Prepositions - Uses - Listening to Inflections - Describing objects/persons/places – Summarizing - Writing a Moral Story.

UNIT-5 **(9Hr)**

"REFLECTIONS OF FUTURE THE YEAR 2050" by Theodore J. Gordon - Conjunctions – Articles - Listening to a passage - Telephone Conversation - Short Story Review - Expansion of Proverbs.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the concepts on behavioral aspects, Development of vocabulary by deriving various ways of forming words, identification of Nouns and Pronouns and their usage, Pronunciation of Phonetic Vowel Sounds, Communicate effectively with others and how to read and understand a passage**.**	PO1, PO10
CO2	Develop Individual and Team Work skills, Knowledge on the usage of foreign language words, identification of and their usage.	PO1, PO9, PO10
CO3	Cultivate Adaptability Skills in work place Knowledge on Grammatical aspects of Verbs and Adverbs. Writing dialogues effectively.	PO1, PO9, PO10
CO4	Understand in Acquiring of Entrepreneurship Skills Usage of grammar aspects on Prepositions Pronunciation of inflectional suffix words by describing objects, persons and places Acquiring writing skills through interpreting moral stories.	PO1, PO9, PO10
CO5	Knowledge to Recognize the need of ability to engage in independent and life-long learning Usage of grammar aspects on Conjunctions and Articles Communicate effectively in English over phone Reviewing a short stories and Expansion of proverbs.	PO1, PO10, PO12

Text Book:

1. The text book prepared by the Department of English of SITAMS.

Other References:

1. Exercises in spoken English: Parts I-III, CIEFL, Hyderabad, Oxford University Press.

2. Communication Skills: Sanjay Kumar and PushpaLatha, Oxford University Press. 2011.

3. Practical English Usage: Michael Swan, Oxford University Press, 1995.

4. Remedial English Grammar: F.T. Wood. Macmillan, 2007.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	-	-	-	-	-	-	3	3	-	-
CO3	3	-	-	-	-	-	-	-	3	3	-	-
CO4	3	-	-	-	-	-	-	-	2	2	-	-
CO5	3	-	-	-	-	-	-	-	-	3	-	2
CO*	3	-	-	-	-	-	-	-	2.66	2.8	-	2

I B.Tech I Semester

		L	T	P/D	C
18SAH113	**ENGINEERING CHEMISTRY**				
	(Common to all Branches)	**2**	**1**	**-**	**3**

Course Educational Objectives:

1. To learn different purification method and analysis the impurities present in water.
2. To develop skill to describe the mechanism and control of corrosion.
3. To train the students to effectively use the knowledge of polymer science.
4. To learn the concept of refractories and to develop skill to apply the concept of Electrochemistry and fuels

UNIT- 1: WATER AND WATER FOR INDUSTRIAL PURPOSE (9Hr)

Water: Sources of water - Types of Impurities in Water - Hardness of water - Temporary and permanent hardness - Estimation of hardness by EDTA Method and numerical problems - Analysis of water - Dissolved oxygen - Disadvantages of hard water - Methods of treatment of water for domestic purpose - Sterilization - Chlorination -Ozonisation. **Water for industrial purpose:** Water for steam making - Boiler troubles - Priming and foaming - Boiler corrosion - Scales and sludge - Caustic embrittlement - Water treatment - Internal treatment - Colloidal - Phosphate - Calgon - Carbonate - Sodium aluminate conditioning of water - External treatment - Ion - exchange process - Demineralization of brackish water – Reverse osmosis.

UNIT - 2: SCIENCE OF CORROSION (9Hr)

Definition - Types of corrosion - Dry corrosion(Direct chemical attack) - Wet corrosion - Theories of corrosion and mechanism - Electro chemical theory of corrosion - Galvanic corrosion - Concentration cell corrosion - Oxygen absorption type - Factors influencing the corrosion - Control of corrosion - Cathodic protection - Sacrificial anode and impressed current cathodic protection method.

UNIT - 3: POLYMERS (9Hr)

Polymerization reactions - Basic concepts - Types of polymerization - Addition and condensation polymerization with mechanism - Plastics -Thermosetting and thermoplastics – Composition, Properties and Engineering applications of teflon, bakelite, nylon and rubber - Processing of natural rubber and compounding.**Elastomers:** Buna S - Buna N - Polyurethane Rubber and Silicone Rubber.

UNIT - 4: PHASE RULE, STRUCTURAL MATERIALS AND REFRACTORIES (9Hr)

Phase rule: Definition - Terms involved in phase rule - Phase rule equation - Phase diagrams - One component system (water system) - Two component system (lead- silver system).**Structural materials:**Cement - Composition of Portland cement - Analysis - Setting and hardening of cement (reactions) and role of gypsum in Portland cement.**Refractories:**Definition - Classification with examples - Criteria of a good refractory material - Causes for the failure of refractory materials.

UNIT - 5: FUELS AND ELECTRO CHEMISTRY (9Hr)

Fuels: Definition and classification of fuels. Liquid fuels- Classification of petroleum, refining of petroleum by Bergius process. Gaseous fuels – natural gas, producer gas, water gas, coal gas and biogas**. Electro Chemistry**: Conductance - Equivalent conductance - Molar conductance – Conduct metric titrations - Conductivity Measurements.**Fuel cells**: Introduction, Hydrogen oxygen fuel cell and methanol fuel cell

Total Hours (45Hr)

Course Outcomes:

On successful completion of course, the student will be able to		POs related to COs
CO1	Demonstrate the fundamentals of water technology and develop analytical skills in determination hardness of water and different purification methods.	PO1, PO2
CO2	Demonstrate the knowledge in corrosion phenomenon and develop skills in different methods for control of corrosion	PO1, PO2
CO3	Demonstrate the knowledge on polymeric materials and to prepare polymeric material for environmental safety .	PO1, PO2,PO7
CO4	Analyze the effect of cement materials, causes for the failure of refractory materials and understanding of phase rule.	PO1, PO2
CO5	Understand and apply the concept of electrochemistry and analysis the fuels and different types of fuels cells.	PO1, PO2

Text books:

1. Chemistry for Engineers, 4/e, 2009, Prof. K. N. Jayaveera, Dr. G. V. Subba Reddy and Dr. C. Ramachandraiah, Tata McGraw Hill Publishers, New Delhi.
2. Text book of Engineering Chemistry, 15/e, 2008, Jain and Jain, DhanpatRai Publishing Company, New Delhi.
3. Text book of Engineering Chemistry, 18/e, 2008, S. S. Dara, S. Chand & Co, New Delhi.

Reference books:

1. Engineering Chemistry, 5/e, 2009, Dr. K. B. Chandrasekhar, Dr. U.N. Dash, Dr.Sujatha Mishra, Scitech Publications(India) Pvt. Ltd, Hyderabad.
2. Fuel Cells Principles and Applications, 4/e, 2008,B.Viswanath, M. AuliceScibioh, Universities press, Hyderabad.
3. Chemistry of Engineering Materials, 3/e, 2008, C.V.Agarwal, Tara Publication, Varanasi.
4. Physical Chemistry, 12/e, 2009, Glasston&Lewis,DhanptharaiPublishers,New Delhi.
5. Engineering Chemistry (Vol.1&2), 5/e, 2004, J C Kuriacose and J. Rajaram, Tata McGraw Hill Publishers, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	2	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	2.6	-	-	-	-	2	-	-	-	-	-

I B.Tech I Semester

		L	T	P/D	C
18SAH114	**ENGINEERING MATHEMATICS – I**				
	(Common to all Branches)	2	1	-	3

Course Educational Objectives:

1. To learn the reduction of a given matrix to echelon and normal forms, rank of a matrix, solve system of linear equations by different methods and determining the eigen values and eigen vectors and develop linear transformation with emphasis on the role of eigen-values and eigen-vectors.
2. To understand the Taylor's and Maclaurin's series of function in single variable and to familiarize the knowledge of partial derivatives, extreme values in multivariables.
3. To identify important characteristics of first order ordinary differential equations(FOODE) and develop appropriate method of obtaining solutions of FOODE and explore the use of FOODE as models in various applications
4. To learn the concepts of Laplace Transforms and inverse Laplace Transforms and to explore the solving initial value problems by using Laplace transform method.

UNIT – 1: MATRICES (9Hr)

Rank - Echelon form and Normal form - Solution of linear system of homogeneous and non-homogeneous equations - Direct methods - Gauss elimination, Gauss Jordan method - Eigen values, Eigen vectors - Properties - Cayley-Hamilton theorem(without proof) - Inverse and powers of a matrix. – Diagonalizationof a matrix using similarity transformation only.

UNIT – 2: DIFFERENTIAL CALCULUS AND ITS APPLICATIONS (9Hr)

Taylor's and Maclaurin's series for single variable (simple examples) - Functions of several variables - Jacobian – Taylor's and Maclaurin's series for two variables - Maxima and minima of functions of two variables - Lagrangian method of undetermined multipliers with three variables only.

UNIT – 3:ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER, FIRST DEGREE AND ITS APPLICATIONS & SPECIAL FUNCTIONS (9Hr)

Exact equations, Equations reducible to exact, Linear and Bernoulli's equation Applications: Orthogonal Trajectories, Newton's law of cooling only.
Beta and Gamma functions – Evaluation of Integrals (Simple examples)

UNIT - 4: LAPLACE TRANSFORM - I (9Hr)

Laplace transform of standard functions - First shifting theorem - Second shifting theorem - Transform of Derivatives & Integrals - Inverse transform.

UNIT - 5: LAPLACE TRANSFORM – II (9Hr)

Laplace Transform of Unit step function, Dirac's delta function and Periodic function - Convolution theorem - Application of Laplace transforms to ordinary differential equations of first and second order.

Total Hours (45Hr)

Course Outcomes

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge in estimating ranks in solving linear equations through matrix methods, eigen values and eigen vectors and to develop analytical skills in solving problems involving diagnoliation using eigen values and eigen vectors	PO1,PO2,P012
CO2	Demonstrate knowledge in Taylor's and Maclaurin's series of a function of single variable, finding maximum and minimum values attained by functions of several variables and Develop analytical skills in solving problems involving functional dependence and independence using partial derivatives	PO1,PO2
CO3	Demonstrate knowledge in first order ordinary differential equations, Develop analytical skills in solving problems involving first order ordinary differential equations and Develop skills in designing Mathematical models for Newton's Law of cooling and orthogonal trajectories	PO1,PO2,P03
CO4	Demonstrate knowledge in Laplace transform and inverse Laplace transform and use the appropriate shift theorems in finding Laplace and inverse Laplace transforms	PO1,PO2
CO5	Develop analytical skills in solving problems involving initial value problems for constant coefficient linear ordinary differential equations using Laplace transform	PO1,PO2,PO3 PO4,PO12

Text books:

1. Engineering Mathematics–I, 2012, T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand and Company Ltd, New Delhi.
2. Higher Engineering Mathematics, 34/e, 1999, Dr. B. S. Grewal, Khanna Publishers, Delhi.

Reference books:

1. Engineering Mathematics for JNTU, 2012, B.V. Ramana, Tata McGraw Hill Publishers, New Delhi.
2. A Text Book of Engineering Mathematics,2011, N.P.Bali,Laxmi publications(P)Ltd, New Delhi.
3. Higher Engineering Mathematics, Dr. M. K. VenkataRamana, National Pub, Madras
4. Engineering Mathematics, Volume - 1, 2012, E.Rukmangadachari, E.Keshava Reddy, Pearson Educations, Chennai.
5. Advanced Engineering Mathematics, 8/e, 2009, Erwin Kreyszig, Wiley India, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	2
CO5	3	3	3	3	-	-	-	-	-	-	-	2
CO*	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

I B. Tech I Semester

18CSE111	**COMPUTER PROGRAMMING**	**L**	**T**	**P**	**C**
	(Common to CSE, ECE, EEE)	**2**	**1**	**0**	**3**

Course Educational Objectives:

1. To design an algorithm for a given problem and illustrate the flowchart to develop C programs using operators.
2. To impart adequate knowledge on conditional and iterative statements to write C programs.
3. To develop programming skills using the arrays, functions and strings.
4. To enable effective usage of structures, pointers and to implement the memory management concepts.
5. To understand the sorting techniques and files concept to show input and output of files.

UNIT 1 - OVERVIEW OF COMPUTERS AND C PROGRAMMING BASICS (9Hr)

Overview of Computers:
Computer Software - Algorithm–Flow Chart–Software Development Method.
C Programming Basics:
Introduction to "C" Programming – Characteristics of C – Structure of a "C" program – Tokens – Constants- Variables – Data Types – Operators and their types-Expressions – Operator Precedence and Associativity– Managing Input and Output Operations.

UNIT 2 – SELECTION, ITERATION STATEMENTS AND ARRAYS (9Hr)
Selection Statements: if Statements - Switch Statement – goto statement.
Iteration Statements: for statement–while statement–do-while Statement.
Arrays: Initialization–Declaration - One-Dimensional Arrays-Two-Dimensional Arrays.

UNIT 3 –FUNCTIONS AND STRINGS (9Hr)
Functions: Library Functions - User Defined Functions–Function Prototype - Function Definition–Function Call – Return Statements - Category of Functions – Nesting of Functions – Passing Arrays to Functions- Recursion – Storage Classes – Pre-Processor Directives
Strings: Declaring and Initializing String Variables–Reading string from terminal - Writing string to the screen - String Operations – String Handling Functions.

UNIT 4 – POINTERS, STRUCTURES AND UNIONS (9Hr)
Pointers: Definition–Initialization–Pointers Arithmetic–Pointers and Arrays.
Structures and Union: Introduction – Need for Structure Data type – Structure Definition – Structure Declaration – Accessing Structure Members - Structure within a Structure – Copying and Comparing Structure Variables - Structures and Arrays – Union.

UNIT 5 - FILE HANDLING, SORTING AND SEARCHING TECHNIQUES (9Hr)
File handling: File Accessing Methods – Sequential Access and Random Access- Basic Operations on Files – File Handling Function.
Sorting and Searching techniques: Bubble sort - Selection sort - Insertion sort – Quick sort – Merge sort -- Linear search - Binary search.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	To obtain the knowledge about the problem solving skills.	PO1, PO2
CO2	To develop programs using the basic elements like iteration statements, Arrays.	PO1, PO2, PO3
CO3	To understand about the code reusability with the help of user defined functions.	PO1, PO2
CO4	To solve the memory access problems by using pointers and design the programs on structures and unions.	PO1, PO2, PO4
CO5	To learn the basics of file handling mechanism that is essential for understanding the concepts of management systems.	PO1, PO2

Text Books:

1. A Structured Programming Approach Using C by Behrouz A. Forouzan& Richard F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C and Data Structures, 2/e, 2012, E.Balaguruswamy, Tata McGraw Hill, New Delhi.

Reference Books:

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education.
2. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.
3. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006.
4. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.
5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	3	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	**2.4**	**2.8**	**3**	**3**	-	-	-	-	-	-	-	-

I B.Tech I Semester

		L	T	P	C
18EEE121	**BASIC ELECTRICAL CIRCUITS**	**2**	**1**	**0**	**3**

Course Educational objectives:

1. To impart knowledge on
   - Fundamentals of electrical circuits
   - Various combinations of electrical network
   - Fundamental laws
   - Determining the circuits parameters through mesh and nodal analysis
2. To develop skill on analyzing different factors of various periodic waveforms and to
3. To introduce phenomenon of
   - Magnetically coupled Circuits
   - Resonance Circuits
4. To inculcate skill on investigating the DC electrical circuits through different network theorems.
5. To inculcate skill on investigating the AC electrical circuits through different network theorems.

UNIT – 1: FUNDAMENDAL CONCEPTS OF ELECTRICAL CIRCUITS (9Hr)

Circuit concept, RLC parameters - Voltage and Current sources, Independent and dependent sources, source transformation - Kirchoff's laws - network reduction techniques, series, parallel, series parallel, star-to-delta transformation - Nodal and Mesh analysis.

UNIT – 2: SINGLE PHASE AC CIRCUITS (9Hr)

R.M.S, Average values and form factor for different periodic waveforms - phase and phase difference of sinusoidal alternating quantities - 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 - Power triangle, power factor-Locus diagrams

UNIT – 3: MAGNETIC CIRCUITS & RESONANCE (9Hr)

Faraday's laws of electromagnetic induction - Concept of self and mutual inductance - dot convention-coefficient of coupling - Magnetic circuits, composite magnetic circuit-Analysis of series and parallel magnetic circuits. Resonance - series& parallel circuits, concept of bandwidth and Q-factor.

UNIT – 4: NETWORK THEOREMS FOR DC EXCITATION (9Hr)

Thevenin's, Norton's, Maximum power transfer, Millman's, Tellegen's, superposition, reciprocity and compensation theorem for DC and Simple Problems.

UNIT – 5: NETWORK THEOREMS FOR AC EXCITATION (9Hr)

Thevenin's, Norton's, Maximum power transfer, Millman's, Tellegen's, superposition, reciprocity and compensation theorem for AC and Simple Problems.

Course Outcomes:

On successful completion of the course the student will be able to,

Course Outcomes		POs related to COs
CO1	Analyse electrical circuits	PO1, PO2, PO3
CO2	Investigate different parameters in single phase AC circuits	PO1, PO2, PO3
CO3	Analyse the magnetically coupled circuits and evaluate the resonance condition for series and parallel RLC network.	PO1, PO2, PO3
CO4	Apply circuit theorems for DC circuits	PO1, PO2, PO3
CO5	Apply circuit theorems for AC circuits	PO1, PO2, PO3

Text Books:

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits",Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

Reference Books:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), DhanpathRai& Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, MahmoodNahri, "Electric circuits", Schaum's series, McGraw-Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-	-	-	-	-	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	2	3	3	-	-	-	-	-	-	-	-	-
CO*	**2.4**	**2.8**	**3**	-	-	-	-	-	-	-	-	-

I B.Tech I Semester

18SAH116	**ENGINEERING CHEMISTRY LAB**	**L**	**T**	**P/D**	**C**
	(Common to all branches)	**-**	**-**	**2**	**1**

Course Educational Objectives:

1. Demonstrate Knowledge on measurement of various analysis of water treatment methods
2. Identify the different salt analysis of copper for engineering and technological applications.
3. Provide valid conclusions on phenomena of dissolved oxygen.

Name of the Experiment

1 Preparation of Standard EDTA solution and Estimation of Hardness of Water
2 Preparation of Standard EDTA and Estimation of Copper
3 Estimation of dissolved oxygen in given water sample
4 Estimation of alkalinity of water
5 Estimation of Acidity of water sample
6 Preparation of Standard Potassium Dichromate and Estimation of Ferrous Iron
7 Preparation of Standard Potassium Dichromate and Estimation of Copper by Iodometry
8 Determination of strength of the given Hydrochloric acid against standard sodium hydroxide Solution by Conductometric titration
9 Conductometric titration of $BaCl_2$Vs Na_2SO_4 (Precipitation Titration)
10 Determination of viscosity of the given oils through Redwood viscometer

Course Outcomes:

On successful completion of the course the will be able to,		**POs related to COs**
CO1	Demonstrate Knowledge on estimation of water treatment methods and other samples.	PO1
CO2	Identify the different salt analysis for engineering and technological applications.	PO2
CO3	Provide valid conclusions on phenomena of different samples.	PO4
CO4	Follow ethical codes during conducting of experiments	PO8
CO5	Do experiments effectively as an individual and as a team member in a group.	PO9
CO6	Communicate verbally and in written form pertaining to results of the Experiments.	PO10
CO7	Learns to perform different experiments involving water for future enhancements.	PO12

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	-
CO7	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	3	**3**	**-**	**3**

I B. Tech I Semester

18CSE112	**COMPUTER PROGRAMMING LAB**	**L**	**T**	**P**	**C**
	(Common to CSE, ECE, EEE Branches)	**0**	**0**	**2**	**1**

Course Educational Objectives:

1. To provide knowledge on flowchart and algorithm to the given problem
2. To exercise conditional and iterative statements to Write C programs
3. To develop the skill of C programs using arrays, strings and functions.
4. To understand C programs using pointers and allocate memory using dynamic memory Management functions.
5. To analyse the files concept to show input and output of files in C

LIST OF EXERCISES:

1. a. Write a C Program to Calculate the Simple Interest.
   b. Write a C Program to Convert the Temperature Unit from Fahrenheit to Celsius using the Formula C= (F-32)/1.8.
   c.Assume that any Month is of 30 Days. Now you are given Total Days. Write a C Program to find out the exact Number of Years - Months & Days.

2. a. Write a Program that Prints the Given 3 Integers in Ascending Order using if - else.
   b. Write a Program to Calculate Commission for the Input Value of Sales Amount. Commission is calculated as per the Following Rules:
      i) Commission is NIL for Sales Amount Rs. 5000.
      ii) Commission is 2% for Sales when Sales Amount is >Rs. 5000and <= Rs. 10000.
      iii) Commission is 5% for Sales Amount >Rs. 10000.
   c. Write a C Program to find the Roots of Quadratic Equation.

3. a. Write a Program, which takes two integer Operands and one Operator from the User, Performs the Operation and then Prints the Result. (Consider the Operators +,-,*, /, %, use switch Statement).
   b. A Character is entered through Keyboard. Write a Program to determine whether the Character Entered is a Capital Letter, a Small Case Letter, a Digit or a Special Symbol. The Following Table shows the Range of ASCII values for various Characters.

Characters	**ASCII values**
A - Z	65 - 90
a - z	97- 122
0 - 9	48 - 57
Special Symbols	0 - 47, 58 - 64, 91- 96, 123 – 127.

4. a. Write a C Program to find the Sum of Individual Digits of a Positive Integer.
   b.A Fibonacci sequence is defined as follows: the First and Second terms in the Sequence are 0 and 1. Subsequent terms are found by adding the Preceding two terms in the Sequence. Write a C Program to Generate the first n terms of the Sequence.

5. a. i) A Perfect Number is a Number that is the Sum of all its Divisors Except Itself. Six is the

Perfect Number. The only Numbers that Divide 6 evenly are 1, 2, 3 and 6 (i.e., 1+2+3=6).
ii) An Abundant Number is one that is Less than the Sum of its Divisors (Ex: 12 <1+2+3+4+6).
iii) A Deficient number is one that is Greater than the Sum of its Divisors (Ex: 9 > 1+3).
Write a Program to Classify N Integers (Read N from keyboard) each as Perfect, Abundant or Deficient.
b. An Armstrong Number is a Number that is the Sum of the Cubes of its Individual Digits.
Write a C Program to Print Armstrong Numbers below 1000.

6. a. Write a C Program to generate all the Prime Numbers between 1 And N, Where N is a Value Supplied by the User.
b. Write a C Program to Calculate the Following Sum: Sum = 1 - x2/2! + x4/4! - x6/6! + x8/8! - x10/10!

7. a.Write a C Program to find both the Largest and Smallest Number in a List of Integers using Arrays.
b.Write a C Program to Perform the Following:
i) Addition of Two Matrices. ii) Multiplication of Two Matrices.

8. a. Write C Programs that use both Recursive and Non-Recursive Functions to find the Factorial of a given Integer.
b. Write C Programs that use both Recursive and Non-Recursive Functions to find the GCD (Greatest Common Divisor) of two given integers.
c. Write C Program to solve Towers of Hanoi Problem using recursive function.

9. a. Write C Programs for Swap/Exchange values of two Integer variables using Call by Reference.
b. Write a C Program using Pointers to Read in an Array of Integers and Print its Elements in Reverse Order.

10. a.Write a C Program to insert a Sub-String into a Given Main String from a Given Position.
b. Write a C Program to Determine if the Given String is a Palindrome or Not.
c. Write a C Program to Count the number of Lines, Words and Characters in a Given Text.

11. You are supposed to generate a Result Table which Consists of Student Id - Student Name - Marks of three Subject and Total Marks. Write a Program which takes Input for Five Students and Displays Result Table. Also Display Student Information Separately Who Got the Highest Total? Use Structures to do it.

12. a.Write a C Program to write into and read from a file.
b. Write a C Program to merge two Files into a Third File. (Note: The File names are specified on the Command Line.)

13. Write C programs to perform the following searching operations for a Key value in a given list of integers: i) Linear search ii) Binary search

14. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort

15. Write a C Program that Implements the Following Sorting Methods to Sort a Given List of Integers in Ascending Order i) Quick sort ii) Merge sort

Course Outcomes:

On successful completion of this course, the students should be able to		**POs related to COs**
CO1	Apply the Knowledge to design the algorithm and flowchart for the given problem.	PO1
CO2	Analyze the concepts of control statements and arrays.	PO2
CO3	Design the programs for functions and strings	PO3
CO4	Solve the memory access problems by using pointers and design the programs on structures and unions.	PO4
CO5	Apply the file handling mechanisms that is essential for understanding the concepts of management systems.	PO5
CO6	Follow the ethical principles in implementing the programs	PO8
CO7	Do experiments effectively as an individual and as a team member in a group.	PO9
CO8	Communicate verbally and in written form, the understanding about the experiments.	PO10
CO9	Continue updating their skill related to loops, pointers and files implementing programs in future.	PO12

Reference Books:

1. Programming in C and Data Structures, E.Balaguruswamy, Tata McGraw Hill,2nd edition
2. Let us C, YashavantKanetkar, BPB, Thirteenth Revised and Updated edition (2013)
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education
4. The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
5. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
6. Computer Basics and C Programming, V. Rajaraman, PHI Publications.

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	2	-	-	-
CO8	-	-	-	-	-	-	-	-	-	2	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	3	**-**	**-**	3	2	**2**	**-**	**3**

I B. Tech I Semester

		L	T	P	C
18EEE122	**BASIC ELECTRICAL CIRCUITS LAB**	**0**	**0**	**2**	**1**

Course Objectives:

1. To gain practical experience on fundamental electric laws.
2. To gain practical experience on verification of theorems.
3. To evaluate the phase angle of RLC circuits practically.
4. To introduce the practical approach on identifying the resonance circuits
5. To evaluate the key parameters of mutually coupled coils through experimentation.

Any Ten of the Following

1. Verification of KCL and KVL.
2. Mesh & Nodal Analysis
3. Verification of Thevenin's Theorem.
4. Verification of Norton's Theorem.
5. Determination of Self, Mutual Inductances and Coefficient of Coupling.
6. Verification of Superposition Theorem.
7. Verification of Maximum Power Transfer Theorem.
8. Series and Parallel Resonance for RLC Circuit.
9. Verification of Compensation Theorem.
10. Verification of Reciprocity Theorem.
11. Verification of Millman's Theorem.
12. Verification of Tellegen's Theorem.
13. Phase Angle Calculation of RL, RC and RLC Circuits
14. Phase Angle Calculation of Parallel RL, RC and RLC Circuits.

Course outcomes:

At the end of the course, students will able to

Course Outcomes		POs related to COs
CO1	Understand the fundamental electrical laws in engineering applications.	PO1
CO2	Verify different network theorems practically.	PO2
CO3	Design electrical circuits for measuring complicated electrical parameters.	PO3
CO4	Approach the electrical circuits practically for identifying the resonance condition.	PO4
CO5	Evaluate the self-inductance, mutual inductance and coefficient of coupling of mutually coupled coils through experimentation.	PO4
CO6	Follow the ethical principles in implementing the experiments.	PO8
CO7	Do experiments effectively as an individual and as a team member in a group.	PO9
CO8	Communicate verbally and in written form, the understanding about the experiments.	PO10
CO9	Continue updating their skill related to electrical circuits	PO12

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	3	-	-	3	3	**3**	-	**3**

I B.Tech II Semester

		L	T	P/D	C
18SAH121	**TECHNICAL ENGLISH (Common to all Branches)**	**2**	**-**	**-**	**2**

Course Educational Objectives:

1. To Provide Knowledge on developing Technical Vocabulary communicating in a verbal manner.
2. To cultivate types of listening skills, Knowledge on the usage of foreign language words in to English Language,
3. To acquire Knowledge on use of technology for societal aspects.
4. To get knowledge on earlier technology used and latter technology in India.
5. To understand the ability to write poems and communicate by using technological words.

UNIT-1: COMMUNICATION SKILLS FOR PROFESSIONALS (9Hr)

Verbal-Areas of communication - Suggestions to improve verbal communication - Non-verbal communication - Category and features - Cultural differences in non - verbal communication - Suggestions to improve non-verbal communication – Tenses - Listening to Dialogues - Role Play - Reading Short Stories

UNIT-2: ACTIVE LISTENING (9Hr)

Introduction -Types of listening -Traits of a good listener - Active versus passive listening - Implications of effective listening – Verbs - Transitive and Intransitive - Identification of TV and ITV in a sentence - Voice of Verbs - Active and Passive - Listening to Intonation - Welcome/Valedictory speech - Reading Poetry - Note Making.

UNIT-3: TECHNOLOGY WITH A HUMAN FACE (A lecture by E.F.Schumacher) (9Hr)

Direct speech and Indirect speech - Modal Verbs - Listening to Short Stories - Conveying Vote of Thanks - Reading News papers - Precise Writing.

UNIT-4:Dr. A.P.J ABDUL KALAM (A missile Man) **(9Hr)**

Question tags - Subject-Verb agreement - Listening to English Songs - Process Description Reading Articles from Journals - Letter writing –official.

UNIT-5: THE EXPRESS – By Stephen Spendor (A Technological poem) **(9Hr)**

Sentence structures (Simple, Compound and Complex sentence) - Listening to speeches - Product Description - Reading Scientific Texts - Paragraph Writing - Essay writing.

Total Hours (45Hr)

Course Outcomes:

On successful completion of course, the student will be able to		POS related to COS
CO1	Acquiring Knowledge on developing Technical Vocabulary by communicating in verbal by using proper tense form in the way of acting and writing.	PO1, PO10
CO2	Acquiring Knowledge on the usage of foreign language words in to English Language through various types of listening skills by observing proper intonation and voice of verbs.	PO1, PO9
CO3	Acquiring Knowledge on the use of technology for societal aspects through listening inspiring biographies of scientists besides learning some grammatical aspects on the usage of direct and indirect speeches by applying modal verbs.	PO1, PO12
CO4	Acquiring knowledge on the achievements made by the scientists on the earth by reading scientific articles from various journals present in the library and through motion pictures in internet.	PO1, PO12
CO5	Understand how to describe a technological gadget through poetical expression by applying technological words besides writing short essays using simple to complex sentence.	PO1, PO10, PO12

Text Books:

1. The text book prepared by the Department of English of SITAMS.

Other References:

1. Exercises in spoken English: Parts I-III, CIEFL, Hyderabad, Oxford University Press.
2. Communication Skills: Sanjay Kumar and PushpaLatha, Oxford University Press. 2011.
3. Practical English Usage: Michael Swan, Oxford University Press, 1995.
4. Remedial English Grammar: F.T. Wood. Macmillan, 2007.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	-	-	-	-	-	-	3	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	-	-	-	-	-	-	3
CO5	3	-	-	-	-	-	-	-	-	2	-	2
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.5**	**-**	**2.66**

I B.Tech II Semester

		L	T	P/D	C
18SAH122	**ENGINEERING MATHEMATICS – II**				
	(Common to all Branches)	**2**	**1**	**-**	**3**

Course Educational Objectives:

1. To develop skill to analyse appropriate method to find the root of the Algebraic and Transcendental Equations and to develop skill to apply the concept of interpolation for the Prediction of required values
2. To identify important characteristics of higher order ordinary differential equations (HOODE) and develop appropriate method of obtaining solutions of HOODE
3. To develop skill to design Sine and Cosine waves with the help of Fourier Series and Transforms.
4. To learn the concepts of z-transformation and inverse z- Transforms and to explore the solving difference equations by using z- transform method.

UNIT – 1: SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS AND INTERPOLATION (9Hr)

Solution of Algebraic and Transcendental Equations: Introduction - The Bisection method - The method of False position - The Iteration method - Newton-Raphson method (Single Variable). **Interpolation:** Introduction - Finite differences - Forward differences - Backward differences - Newton's forward and backward difference formulae for interpolation - Lagrange's formula.

UNIT – 2: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (9Hr)

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax} ,Sin ax, Cos ax, polynomials in x, e^{ax} v(x), x^m v(x) - Method of variation of parameters – Differential Equations reducible to constant coefficients: Cauchy-Euler equation and Legendre linear equation

UNIT – 3: FOURIER SERIES (9Hr)

Determination of Fourier coefficients - Fourier series - Even and odd functions - Fourier series in an arbitrary interval - Even and odd periodic continuation - Half-range Fourier sine and cosine expansions.

UNIT – 4: FOURIER TRANSFORMS (9Hr)

Fourier integral theorem(only statement) - Fourier sine and cosine integrals - Fourier transform - Fourier sine and cosine transforms - Properties - Inverse transforms - Finite Fourier transforms.

UNIT –5: Z- TRANSFORMS (9Hr)

Z-transforms - Properties - Damping rule - Shifting rule - Initial and final value theorems - Inverse Z-transform - Convolution theorem - Solution of difference equations by Z-transforms

Total Hours (45Hr)

Course Outcomes:

On successful completion of course, the student will be able to		POs related to COs
CO1	Acquire knowledge in solving algebraic and transcendental equations by various mathematical methods and Design novel polynomials to the given data.	PO1,PO2, PO12
CO2	Acquire knowledge in higher order linear differential equations and develop analytical skills in solving problems involving higher order non-homogeneous linear differential equations.	PO1,PO2
CO3	Develop analytical skills in evaluating the properties of functions through Fourier series.	PO1,PO2, PO3
CO4	Acquire knowledge in Fourier transform and its properties, which can be used in communication theory and signal analysis, image processing and filters, data processing and analysis	PO1,PO2
CO5	Acquire knowledge in Z-transform and its properties and develop analytical skills in solving difference equations using Z-transform techniques.	PO1,PO2,PO3, PO4,PO12

Text books:

1. Mathematical Methods, 2012, T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad , S. Chand and Company Ltd, New Delhi.
2. Higher Engineering Mathematics, 34/e, 1999, Dr. B. S. Grewal, Khanna Publishers, Delhi

Reference books:

1. Engineering Mathematics–I, 2012, T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand and Company Ltd, New Delhi.
2. Engineering Mathematics for JNTU, 2012, B.V. Ramana, Tata McGraw Hill Publishers, New Delhi.
3. Higher Engineering Mathematics, Dr. M. K. VenkataRamana, National Pub & Co, Madras.
4. A Text Book of Engineering Mathematics,2011, N.P.Bali, Laxmi publications(P)Ltd, New Delhi.
5. Advanced Engineering Mathematics, 8/e, 2009, Erwin Kreyszig, Wiley India, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	1
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1
CO*	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

I B.Tech II Semester

		L	T	P/D	C
18SAH112	**ENGINEERING PHYSICS (Common to all Branches)**	**2**	**1**	**-**	**3**

Course Educational Objectives:

1. To understand the principles and applications optics, Lasers and Optical Fibers in various Streams of Engineering
2. To analyse the structure of crystals by using X-Ray Diffraction Technique and to study properties, productions and applications of ultrasonic
3. To develop ideas & mathematical solutions to Quantum mechanics& Semiconductors
4. To recognize the concepts of Superconductors and classification of magnetic materials
5. To Introduce Nano-materials & their applications in various fields of science and technology

UNIT - 1: PHYSICAL OPTICS, LASERS AND FIBER OPTICS (9Hr)

Physical Optics: Interference in thin films by reflection (Qualitative Analysis) - Newton's rings (Qualitative) – Diffraction – Fraunhofer Diffraction at single slit- Diffraction Grating.**Lasers:** Laser characteristics – Spontaneous and Stimulated emissions - Population inversion –Pumping Mechanisms-Solid state laser (Ruby laser) - Gas (He-Ne) laser - Applications of lasers.**Fiber Optics**: Principle of Optical Fiber-Structure of optical fiber - Types of optical fibers –Step Index and Graded Index Fibers- Numerical aperture –Acceptance angle-Fiber optics in communications (Block Diagram)–Simple Applications.

UNIT - 2: CRYSTAL STRUCTURES AND ULTRASONICS (9Hr)

Crystal Structures: Introduction - Space lattice –Basis-Unit cell - Lattice parameters - Crystal Systems - Structures of Simple Cubic - Body Centered Cubic - Face Centered Cubic crystals - X-ray diffraction- Bragg's law –Laue Method of X-Ray Diffraction.**Ultrasonics:** Introduction – Properties of ultrasonic waves - Piezoelectric Effect- Production of ultrasonic waves by Piezoelectric method -Applications of Ultrasonics.

UNIT - 3: QUANTUM MECHANICS AND SEMI CONDUCTORS (9Hr)

Quantum Mechanics: de Broglie's Hypothesis- Kinetic Energy and de Broglie wavelength – de Broglie wavelength of electrons -Properties of Matter waves-Time independent Schrodinger's wave equation –Physical Significance of Wave function-Particle in one dimensional potential box (Only upto Eigen Values of Electrons). **Semiconductors:** Intrinsic and extrinsic semiconductors (Qualitative) - Drift and diffusion - Hall Effect –Applications of Hall Effect- Direct and indirect band gap semiconductors

UNIT - 4: MAGNETIC MATERIALS AND SUPERCONDUCTIVITY (9Hr)

Magnetic Materials: Classification of dia - para - ferro magnetic materials on the basis of magnetic moment (Qualitative) - Hysteresis curve - soft and hard magnetic materials and

Applications. **Superconductivity:** General properties - Meissner Effect – Type-I and Type-II superconductors - BCS Theory - Josephson's effect - Applications of superconductors.

UNIT - 5: PHYSICS OF NANOMATERIALS (9Hr)

Nanomaterials: Introduction to Nanomaterials –Types of Nano materials (One dimensional, Two dimensional and Three dimensional Nano materials) - Significance of nanoscale- surface to, volume ratio –Quantum Confinement effect-Synthesis of Nanomaterials - Ball milling Method - Chemical vapour deposition methods –Optical, thermal, mechanical and electrical properties of nano materials - Applications of Nanomaterials.

Total Hours (45Hr)

Course Outcomes

On successful completion of the course the students will be able to		POs related to COs
CO1	Acquire the knowledge and applications on Optics, LASERS and Fiber Optics.	PO1, PO2
CO2	Identify appropriate method for the production of Ultrasonics and their usage and understanding different crystal structures	PO1, PO2
CO3	Develop the skills to solve complex problem in quantum mechanics and Semiconductors	PO1, PO2,PO4
CO4	Analyze the concepts of Superconductors and magnetic materials and their appropriate applications in the field of Engineering and Technology	PO1,PO2
CO5	Apply the theoretical concepts pertaining to Nanomaterials in various fields engineering and Technology	PO1,PO12

Text Books:

1. Engineering Physics, 2011, M.R. Srinivasan, New Age International, Chennai.
2. Engineering Physics, First Edition 2014, K. Thyagarajan, McGraw Hill Publishers, New Delhi.

Reference Books:

1. Concepts of Modern Physics, 8/e, 2007, AurtherBeiser, Tata McGraw Hill Publishers, New Delhi.
2. Modern Engineering Physics, 2012, A.S. Vasudeva, S. Chand & Co., New Delhi.
3. Materials Science, 1/e, 2004,M. Vijaya and G. Rangarajan, Tata McGraw Hill Publishers, New Delhi .
4. Physics, Part I and II(Part I 5/e,2002, Part II 5/e,2001), Halliday and Resnick, John Wiley & Sons (Asia)
5. R5 :Engineering Physics, 7/e, 2006, Gaur & Gupta, DhanpatiRai Publications, New Delhi .

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-		-	-	-	-	-	-	-
CO2	2	3		-	-	-	-	-	-	-	-	-
CO3	2	2		3	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	1
CO*	**2.6**	**2.25**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

I B. Tech II Semester

18MEC111	**ENGINEERING GRAPHICS**	**L**	**T**	**P/D**	**C**
	(Common to all branches)	**1**	**0**	**4**	**3**

Course Educational Objectives:

1. To expose them to existing national and international standards related to technical drawings.
2.To develop drawing skills for communication of concepts, ideas and design of engineering products.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of drawings in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size and layout of drawing sheets - Lettering, numbering and dimensioning - Basic geometrical constructions.

UNIT – 1: ENGINEERING CURVES (9Hr)

Engineering Curves: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method and rectangular hyperbola – Construction of cycloid, epi cycloid and hypo cycloid – Construction of involutes of square and circle – Tangent and normal for the above curves.

UNIT – 2: PROJECTION OF POINTS, LINES AND PLANE SURFACES (9Hr)

Projection of Points: Principles of orthographic projection – Conventions – First angle projection and third angle projections – Projection of points. **Projection of Lines:** Projection of straight lines (only first angle projections) inclined to one and both the principal planes – Determination of true lengths and true inclinations by rotating line method. **Projection of Planes:** Regular planes inclined to one and both the principal planes by change of position method.

UNIT – 3: PROJECTION OF SOLIDS AND SECTION OF SOLIDS (9Hr)

Projection of Solids: Projection of simple solids like prisms, pyramids, cylinder and cone, when the axis is inclined to one principal plane. **Section of Solids:** Sectioning of right regular solids like prisms, pyramids, cylinder and cone, the solids are in simple vertical position and inclined to one plane, when the cutting plane is inclined to one of the principal planes – Obtaining true shape of section.

UNIT – 4: DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTIONS (9Hr)
Development of Surfaces: Development of lateral surfaces of simple and sectioned solids like prisms, pyramids, cylinder and cone. **Isometric Projection:** Principles of isometric projection – Isometric scale – Isometric projections of simple solids and truncated solids like prisms, pyramids, cylinder and cone.

UNIT – 5: ORTHOGRAPHIC PROJECTIONS AND PERSPECTIVE PROJECTIONS

(9Hr)

Orthographic Projections: Principles and methods of orthographic projections – Plane of projections – Representation of three dimensional objects – Layout of views – Conversion of 3D objects to 2D objects. **Perspective Projection:** Perspective projection of simple solids like prisms and pyramids by visual ray method.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course, students will be able to:		**POs related to COs**
CO1	Construct Engineering Curves and generate tangent and normal for those curves.	P01,P02,P03,PO10
CO2	Draw Projection of Points, lines and Plane Surfaces.	P01,P02,P03, PO10
CO3	Draw Projection of Solids, Sections of Solids like Prisms, Pyramids, Cylinder& Cone.	P01,P02,P03, PO10
CO4	Construct Isometric Scale, Projections and develop the development of surfaces	P01,P02,P03, PO10
CO5	Draw Orthographic and Perspective projections of Solids	P01,P02,P03, PO10

Text Books:

1. Engineering Drawing, N.D. Bhatt and V. M. Panchal, 50th edition, Charotar Publishing House, 2010.
2. A Text book of Engineering Graphics, K.V.Natrajan, 2009, Dhanalakshmi Publishers, Chennai.

References Books:

1. Engineering Drawing, K.L.Narayana and P.Kannaiah, 2/e, 2012, Scitech Publishers.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production, Luzzader, Warren.J and Duff,John M., 2005, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi.
3. Engineering Graphics, K.Venugopal and V.Prabhu Raja, 2008, New Age International (P) Limited.
4. Engineering Drawing, M.B.Shah and B.C.Rana, 2/e, 2009, Pearson Education.
5. Engineering Drawing, Basant Agarwal and C.M.Agarwal, 2008, Tata McGraw Hill Publishing Company Limited, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	1	-	-
CO2	2	3	3	-	-	-	-	-	-	1	-	-
CO3	2	3	3			-	-	-	-	1	-	-
CO4	2	3	3	-	-	-	-	-	-	2	-	-
CO5	2	3	3	-	-	-	-	-	-	2	-	-
CO*	2	2.8	2.8	-	-	-	-	-	-	1.4	-	-

I B.Tech II Semester

		L	T	P/D	C
18CSE121	**PROBLEM SOLVING USING PYTHON PROGRAMMING (Common to all Branches)**	**2**	**1**	**-**	**3**

Course Educational Objectives:

1. To understand the basics of problem solving and python programming.
2. To develop the basic skills of Python program in interactive and script mode.
3. To design control structure like selection control and iterative control statement.
4. To construct Python programs using Lists, Dictionaries and sets
5. To build Python Programs using functions, software object, turtle graphics, file handling to read and write data from/to files.

UNIT- 1: INTRODUCTION TO PROBLEM SOLVING (9Hr)

Fundamentals: what is computer science - Essence of computational problem solving - Limits of computational problem solving - Computer Algorithms - Computer Hardware - Computer software - Computational problem solving.**Python programming language:** IDLE python development environment - python standard library - Bit of python - learning how to use IDLE - First program in Python. **Problem solving example:** Calculating the Drake Equation.

UNIT- 2: DATA AND EXPRESSIONS (9Hr)

Literals: Numeric literals - String literals - Control characters - String formatting - Implicit and explicit line joining. **Variables and Identifiers:** Variable assignment and keyboard input – Identifiers - keywords and other predefined identifiers. **Operators, Expressions and Data types**: Operators - Arithmetic Operators – Expressions - Operator precedence - Operator Associativity - Data type - Multi-type expression. **Computational Problem solving:** Restaurant Tab calculation and Age in seconds.

UNIT- 3: CONTROL STRUCTURES (9Hr)

Control Structures and Boolean expressions: Control structures - Relational operators - Membership operators - Boolean operators - Operator precedence and Boolean Expressions - Short-Circuit Evaluation - Logically Equivalent Boolean Expression. **Selection Control:** If statement - Indentation in python - Multi-Way Selection. **Iterative Control:** While statement - Infinite Error Checking - Infinite loops - Definite Vs Infinite loops - Boolean Flags and Indefinite loops. **Problem Solving:** Numbers of days in month and Calendar month programs.

UNIT-4: LISTS, DICTIONARIES AND SETS (9Hr)

Lists: List structures - Common list operations - List traversal - Lists in Python - Python list type – Tuples – sequences - Nested lists - Iterating over lists in python - For loop - Built-in range function - Iterating over list elements vs. List index values - While loops and lists - More on Python lists.**Dictionaries and Sets**: Dictionary types in Python - Set data type. **Problem solving:** Chinese

Zodiac Program - Password Encryption/Decryption Program - Calendar Month program and A Food Co-op's Worker Scheduling Simulation.

UNIT-5: FUNCTIONS, SOFTWARE OBJECTS AND TEXT FILES (9Hr)

Functions: Function routines - Defining Functions - Calling Value-Returning Functions - Calling Non-Value-Returning Functions - Parameter Passing -Keyword Arguments in Python - Default Arguments in Python - Variable Scope. **Software Objects:** Object references - Turtle graphics - creating a Turtle Graphics Window - the "Default" Turtle - Fundamental Turtle Attributes and Behavior - Additional Turtle Attributes - Creating Multiple Turtles. **Text Files:** Fundamentals – opening - reading and writing text files - string processing – traversal - operations and methods. **Problem solving:** Temperature conversion - GPA calculation and Credit card calculation.

Course Outcomes

On successful completion of this course the students should be able to		**POs related to COs**
CO1	Demonstrate problem approaches techniques and acquire knowledge in IDLE development environment in interactive and script mode	PO1, PO2,PO5
CO2	Indentify computational problem solving approaches to solve problems using python variables, expression and operators	PO1, PO2, PO5
CO3	Identify and develop python programs using control structures like selection control and iterative control statements.	PO1, PO2, PO3, PO5
CO4	Analyze lists, set, tuples and dictionaries to develop python program.	PO1, PO2, PO3, PO5
CO5	Understand and Build Python Programs using functions, software objects, turtle graphics and file handling to read and write data from/to files.	PO1, PO2, PO3, PO4,PO5

Text Books:

1. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2016.
2. Mark Lutz, "Programming Python," O'Reilly Publications, Fourth Edition, 2011.

Reference Books:

1. Kenneth Lambert and B.L. Juneja, Fundamentals of Python, Cengage Learning, Third Edition, 2012.
2. Python Programming: A Modern Approach, VamsiKurama, Pearson.
3. Learning Python, Mark Lutz, Orielly.
4. Introduction to Python, Kenneth A. Lambert, Cengage.

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	2	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-
CO4	3	3	2	-	2	-	-	-	-	-	-	-
CO5	3	3	3	2	2	-	-	-	-	-	-	-
CO*	3	2.8	2.3	2	2	-	-	-	-	-	-	-

I B.Tech II Semester

18SAH115	**ENGINEERING PHYSICS LAB**	**L**	**T**	**P/D**	**C**
	(Common to all branches)	**-**	**-**	**2**	**1**

Course Educational Objectives:

1. To Demonstrate Knowledge on measurement of various physical quantities using optical Methods and fundamentals of magnetic fields.
2. To Identify different physical properties of materials like band gap, magnetic field Intensity etc, for engineering and technological applications
3. To provide valid conclusions on phenomena Interference and Diffraction.

Name of the Experiment

1 Diffraction grating - Measurement of wavelength of given Laser.
2 Determination of magnetic field along the axis of a current carrying circular coil - Stewart Gees method
3 Determination of numerical aperture and acceptance angle of an optical fiber
4 Determination of particle size using a laser source
5 Parallel fringes – Determination of thickness of thin object using wedge method
6 Newton's rings – Determination of radius of curvature of given plano convex lens
7 B-H curve – Determination of hysteresis loss for a given magnetic material
8 Determination of Energy band gap of semiconductor

Course Outcomes:

On completion of the laboratory course the student will be able to		**POs related to COs**
CO1	Demonstrate Knowledge on measurement of various physical quantities using optical methods and fundamentals of magnetic fields	PO1
CO2	Identify different physical properties of materials like band gap, magnetic field intensity etc, for engineering and technological applications	PO2
CO3	Provide valid conclusions on phenomena Interference and Diffraction	PO4
CO4	Follow ethical values during conducting of Experiments	PO8
CO5	Work individually or in a team effectively	PO9
CO6	Communicate verbally and in written form pertaining to results of the Experiments	PO10
CO7	Learns to perform experiments involving physical Phenomena in future years	PO12

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-		-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	-
CO7	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**-**	**3**	-	-	-	3	3	**3**	**-**	**3**

I B. Tech II Semester

18CSE122	**PROBLEM SOLVING USING PYTHON PROGRAMMING LAB**	**L**	**T**	**P/D**	**C**
	(Common to all branches)	**-**	**-**	**2**	**1**

Course Educational Objectives:

1. To design the algorithms and flowchart for python programs.
2. To understand the concepts of expressions and control structures in python
3. To develop the python programs using functions.
4. To analyze the concepts of python lists, tuples and dictionaries.
5. To gain knowledge on file handling using python programming

Recommended Systems/Software Requirements:

- For Windows: IDLE/ Spyder python development environment.
- For Linux: Default python version installed/ higher version.

LIST OF EXERCISES:

Task-1:

Develop and analyze various phases of Software Development Life cycle (SDLC) through Gantt chart.

Task-2:

a) Design a flowchart for biggest of three numbers.
b) Design a flowchart to find whether the given input is leap year or not.
c) Develop a flowchart to display the multiple of 3 up to 100.

Task-3:

a)Write a python script to calculate the Drake equation.
b) Develop a simple python scripts to illustrate numeric literals and string literals.

Task-4:

a) Write a python script to calculate Restaurant Tab calculation.
b) Write a python program to calculate the approximate number of atoms that the average person contains and the percentage of the universe that they comprise.
c) Write a Python program to read temperature from the user in Fahrenheit and displays the equivalent temperature in Celsius.

Task-5:

a) Write a python program to determine the approximate age of an individual in seconds.
b) Write a Python program that prompts the user for two integer values and displays the result of the first number divided by the second with exactly two decimal places displayed.
c) Write a Python program that prompts the user for two floating-point values and displays the result of the first number divided by the second with exactly six decimal places displayed.

Task-6:

a) Write a Python program in which the user enters either 'A' - 'B'or 'C'. If 'A' is entered the program should display the word 'Apple' - if 'B' is entered it displays 'Banana' - and if 'C' is entered it displays 'Coconut'.

b) Repeat 6a) using if statement with elifheaders instead.

c) Write a Python program in which a student enters the number of college credits earned. If the number of credits is greater than 90 - 'Senior Status' is displayed- if greater than 60 -'Junior Status' is displayed - if greater than 30 - 'Sophomore Status' is displayed else 'Freshman Status' is displayed.

Task-7:

a) Write a program to sum a series of (positive) integers entered by the userexcluding all numbers that are greater than 100.

b) Write a program in which the user can enter any number of positive and negative integer values that displays the number of positive values entered as well as the number of negative values.

Task-8:

a) Write a program containing a pair of nested while loop that displays the integer values 1–100. ten numbers per row - with the columns aligned as shown below

```
 1  2  3  4  5  6  7  8  9 10
11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30
.
.
91 92 93 94 95 96 97 98 99 100
```

b) Display the integer values 1–100 as given in question 8a) using only *one* while loop.

Task-9:

a) Write a python script to calculate the number of days in a month.

b) Write a python program to display a calendar month for any given month between January 1800 and December 2099.

Task-10:

a) Write a Python program that prompts the user for a list of integers - stores in another list only those values between1–100 and displays the resulting list.

b) Write a Python program that prompts the user to enter a list of first names and stores them in a list. The program should display how many times the letter 'a' appears within the list.

Task-11:

Write a Python script to generate all the possible spellings of the last four digits of any given phone number – use Dictionaries.

Task-12:

a) Write a Python function named **zeroCheck** that is passed with three integers and returns true if any of the integers is 0 otherwise it returns false.

b) Write a Python function named **ordered3** that is passed three integers, and returns true if the three integers are in order from smallest to largest otherwise it returns false.

Task-13:

a) Write a python script that allows a user to convert a range of values from Fahrenheit to Celsius or Celsius to Fahrenheit using functions.

b) Write a Python function named **Hello World** that displays

"Hello World, my name is *name* "for any given name passed to the routine.

Task-14:

Write a python script to create a simple text file. Write the contents into the created file and read the contents from the file and display the same on to the console screen.

Task-15:

Mini project: Horse Race Simulation

Create a visualization of a horse race using python script in which horses are moved ahead a random distance at fixed intervals until there is a winner.

Course Outcomes:

On successful completion of this course the students should be able to		**POs related to COs**
CO1	Acquire knowledge on algorithms and flowcharts for given problems	PO1
CO2	Implement conditionals and loops to design the python programming	PO2
CO3	Develop Python programs step-wise by defining functions and calling them.	PO3
CO4	Analysis and Design the lists, set, tuples and dictionaries	PO4
CO5	Use Python Programming tools for file handling mechanisms to read and write data from/to files.	PO5
CO6	Follow the ethical principles in implementing the programs	PO8
CO7	Do experiments effectively as an individual and as a team member in a group.	PO9
CO8	Communicate verbally and in written form, the understanding about the experiments.	PO10
CO9	Continue updating their skill related to lists, tuples and dictionaries implementing programs in future.	PO12

Reference Books:

1. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2016.
2. Mark Lutz, "Programming Python," O'Reilly Publications, Fourth Edition, 2011.

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	2	-	-	-
CO8	-	-	-	-	-	-	-	-	-	2	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	3	-	-	3	2	**2**	-	**3**

I B.Tech II Semester

18 MEC112	**ENGINEERING WORKSHOP AND IT WORKSHOP (Common to all branches)**	**L**	**T**	**P/D**	**C**
		-	**-**	**2**	**1**

Course Educational Objectives:

1. To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical and electrical engineering.
2. To include training on PC Hardware, Internet & World Wide Web and Productivity Tools including Word, Excel and Power Point.

A. ENGINEERINGWORKSHOP

TRADES FOR EXERCISES:

1. **Carpentry:** Two exercises from: Middle T lap joint – Dove tail lap joint – Mortise and tenon joint from out of 300 x 50 x 35 mm soft wood stock.
2. **Sheet Metal:** Two exercise from: Square tray – Open scoop – Frustum of pyramid from out of 22 or 20 gauge G.I. sheet.
3. **Fitting:** Two exercises from: Square joint – V joint – Dove tail joint from out of 50 x 50 x 5 mm M.S. flat piece.
4. **House Wiring:** Two exercise from: Two lamps controlled by one switch in series and parallel – One lamp controlled by 2 two way switches (stair case) – Wiring for fluorescent lamp.
5. **Plumbing:** Two exercise from: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
6. **Machining:** Exercise on drilling and tapping.

TRADES FOR DEMONSTRATION:

a. Lathe machine.
b. Grinding machine.
c. Arc and gas welding.

Course Outcomes (EngineeringWorkshop):

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Demonstrate the knowledge on differ tools used in carpentry, fitting, sheet metal, basic machining process, house wiring and plumbing sections	PO1
CO2	Analyze the basic pipeline connection using different joining connections	PO2
CO3	Design small components using different materials includes wood, GI sheet and MS plates	PO3
CO4	Apply basic electrical engineering tools on the house wiring practice	PO5
CO5	Follow the ethical principles in while doing the exercises.	PO8
CO6	Do the exercises effectively as an individual and as a team member in a group.	PO9
CO7	Communicate verbally among team members and in written form, the understanding about the trade exercises.	PO10
CO8	Continue updating their skill related to trades.	PO12

Text Books:

1. Lab manual provided by the department.

CO – PO MAPPING

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	1	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	1	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	2	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	2
CO*	3	2	1	-	1	-	-	2	3	2	-	2

ITWORKSHOP

PC HARDWARE

1. Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
2. Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video shall be given as part of the course content.
3. Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
4. Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva
5. **Hardware Troubleshooting:** Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva
6. **Software Troubleshooting:** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

LaTeX and Word

7. **Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
8. Using LaTeX and Word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Excel

9. **Excel Orientation:**The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.
10. Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

LaTeX and MS/equivalent (FOSS) tool Power Point

11. Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and PowerPoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).
12. Second Exercise helps students in making their presentations interactive. Topic covered during this Exercise includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Internet& World Wide Web

13. **Internet & World Wide Web** -Orientation & Connectivity Boot Camp : Students should get connected to their Local Area Network and access the Internet. In the process they configure the

TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.

14. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated by the student to the satisfaction of the instructors.

Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computers to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer.

Course Outcomes (ITWorkshop):

On the successful completion of this course, the student should be able to,		**POs related to COs**
CO1	Acquire knowledge on computer system such as system unit, input devices, and output devices connected to the computer.	PO1
CO2	Demonstrate the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.	PO2
CO3	Demonstrate the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.	PO3
CO4	Familiarize with parts of MS Office, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.	PO5
CO5	Follow the ethical principles in implementing the programs	PO8
CO6	Do experiments effectively as an individual and as a team member in a group.	PO9
CO7	Communicate verbally and in written form, the understanding about the experiments and	PO10
CO8	Continue updating their skill related to MS Office, Internet and Computer in future.	PO12

Reference books:

1. Comdex Information Technology course tool kit , 2003, Vikas Gupta, WILEY Dream tech, New Delhi
2. The Complete Computer upgrade and repair book, 3/e, 2008, Cheryl A Schmidt, WILEY Dream Tech,New Delhi
3. Introduction to Information Technology, 2008, ITL Education Solutions limited, Pearson Education, New Delhi
4. PC Hardware and A+ Handbook, 2004, Kate J. Chase, Microsoft press
5. LaTeX Companion,2/e, 2002, Leslie Lamport, Addison Wesley, New Delhi
6. IT Essentials PC Hardware and Software Companion Guide, 3/e, 2008, David Anfinson and Ken Quamme, CISCO Press, Pearson Education, New Delhi
7. IT Essentials PC Hardware and Software Labs and Study Guide, 3/e, 2008, Patrick Regan, CISCO Press, Pearson Education, New Delhi
8. Troubleshooting, Maintaining and Repairing PCs, 5/e, 2008, S.J.Bigelow, TMH, New Delhi

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	2	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	1	-	-	-	-	-	-	-	-	-
CO.4	-	-	-	-	1	-	-	-	-	-	-	-
CO.5	-	-	-	-	-	-	-	2	-	-	-	-
CO.6	-	-	-	-	-	-	-	-	3	-	-	-
CO.7	-	-	-	-	-	-	-	-	-	2	-	-
CO.8	-	-	-	-	-	-	-	-	-	-	-	2
CO*	3	2	1	-	1	-	-	2	3	2	-	2

II B.Tech I Semester

18SAH211	**ENGINEERING MATHEMATICS – III**	**L**	**T**	**P/D**	**C**
	(Common to all Branches)	**2**	**1**	**0**	**3**

Course Educational Objectives:

1. To learn the method of evaluation of numerical integration and to solve ordinary differential equations numerically using numerical methods
2. To learn the concepts of double and triple integrals and compute double and triple integrals
3. To learn partial differential equations and how they can serve as models for physical processes and also master the technique of separation of variables to solve partial differential equation
4. To develop skill to explain the characteristics of scalar and vector valued functions and master these in calculations, provide a physical interpretation of the gradient, divergence, curl and related concepts and carry out differentiation and integration of vector valued functions

UNIT – 1: NUMERICAL INTEGRATION AND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (9Hr)

Numerical integration: Trapezoidal rule - Simpson's 1/3 Rule - Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series - Picard's method of successive approximations - Euler's method - Runge-Kutta methods - Predictor-Corrector method - Milne's method.

UNIT – 2: MULTIPLE INTEGRALS (9Hr)

Multiple Integrals: Double and triple integrals - Change of variables - Change of order of integration.

UNIT - 3: PARTIAL DIFFERENTIAL EQUATIONS (9Hr)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Method of separation of variables.

UNIT - 4: VECTOR DIFFERENTIATION (9Hr)

Introduction to Vector Differentiation, Scalar and Vector point functions- Gradient of a Scalar function - Divergence & Curl of a Vector function and their properties.

UNIT - 5: VECTOR INTEGRATION (9Hr)

Line Integral - Potential function - Area , Surface and volume integrals - Green's , Stoke's and Gauss divergence theorem(excluding their proof) - Verification of Green's, Stoke's and Gauss divergence theorems.

Total Hours (45Hr)

Course Outcomes:

	On successful completion of the course, students will be able to	POs related to COs
CO1	Demonstrate knowledge infinding the numerical values to integrals through different mathematical methods and solving ordinary differential equations numerically through various methods and Design novel mathematical methods for solving the ordinary differential equations.	PO1,PO2, PO12
CO2	Demonstrate knowledge inevaluating double and triple integrals	PO1,PO2, PO12
CO3	Develop analytical skills for the problems involving partial differential equations and the methods to solve them	PO1,PO2, PO12
CO4	Demonstrate knowledge in differentiation of vector functions and to provide an understanding of characteristics of scalar and vector valued functions and master these in calculations, provide a physical interpretation of the gradient, divergence, curl and related concepts.	PO1,PO2, PO12
CO5	Demonstrate knowledge in integration of vector functions and to Develop skills in providing solutions for line, surface and volume integrals by vector methods and work done, flux through vector integrations and correlate them with the applications of various integral theorems	PO1,PO2, PO12

Text Books:

1. Mathematical Methods, 2012, T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad , S. Chand and Company Publishers, New Delhi.
2. Higher Engineering Mathematics, 34/e, 1999, Dr. B. S. Grewal, Khanna Publishers, Delhi

Reference books:

1. Engineering Mathematics–I, 2012, T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand and Company Ltd, New Delhi.
2. Engineering Mathematics for JNTU, 2012, B.V. Ramana, Tata McGraw Hill Publishers, New Delhi
3. Advanced Engineering Mathematics, 8/e, 2009, Erwin Kreyszig, Wiley India, New Delhi.
4. Introductory Methods of Numerical Analysis, S SSastry, 4/e 2005, PHI Publishers.
5. A Text Book of Engineering Mathematics, 2011, N.P.Bali, Laxmipublications(P)Ltd, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	-	-	-	2
CO5	3	3	-	-	-	-	-	-	-	-	-	2
CO*	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

II B.Tech I Semester

18MBA212	**BUSINESS MANAGEMENT (Common to all Branches)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Educational Objectives:

1. To make students understand the basic perspectives of Business management concepts,theories and practices
2.To gain and apply the basic knowledge for understanding areas of Production and costanalysis
3.To provide the students with the conceptual framework of Management and business organizations
4. To make students understand the concepts of HRM ans Marketing concepts
5. To analyse the contemporary issues in management

UNIT - 1: Business Economics: (9Hr)

Nature and scope of business economics - **Demand analysis**: Demand Determinants, Law of Demand - **Elasticity of demand:** Types, Measurement and Significance of Elasticity of Demand

UNIT - 2: Production and Cost Analysis : (9Hr)

Production Function - Laws of returns to scale –Meaning of Cost – Cost Concepts – Cost Function-Cost Output Relationship in Short run and Long run – Break-even Analysis: Meaning, Assumptions, Graphical Representation of BEA, Determination of BEP, Margin of Safety Make or Buy Decision (Simple Problems)

Unit – 3: Managementand Business Organisations: (9Hr)

Management:Nature, Significance and Functions of Management.
Features of Business, Types of Business Organizations: Sole Proprietorship, Partnership, Joint Stock Company, and Public enterprises.

Unit – 4: HR and MarketingManagement: (9Hr)

Introduction to HR, Functions of HR Manager (Manpower Planning Recruitment, Selection, Training & Development, Performance Appraisal), Grievances handling and negotiations

Marketing**:** Functions of Marketing- Marketing Mix- Pricing methods- Promotional practices and Channels of distribution - Product Life Cycle - Basic concepts of Advertising-Marketing Research - e-Marketing - Marketing through social media, pricing strategies in internet era.

Unit – 5: Contemporary Issues in Management: (9Hr)
Basic Concepts of MIS and ERP – Total Quality Management (TQM) – Six Sigma – Business Process Re-engineering – Just-In-Time (JIT) – Business Process Outsourcing (BPO) – Knowledge Process Outsourcing (KPO)

Total Hours (45Hr)

Course Outcomes:

After the completion of this course, a successful student is able to		POs related to COs
CO1	Understand the business economics	PO3, PO5, PO7
CO2	Understand the production and cost analysis and apply the break-even analysis	PO2, PO4, PO5
CO3	Understand the management and various types of business organisations	PO7
CO4	Understand human resource and marketing management and apply techniques to measure the performance	PO5
CO5	know the contemporary issues in management and apply techniques	PO1,PO2, PO5, PO7, PO9, PO12

Reference Books:

1. Managerial Economics and Financial Analysis, 4/e, 2011, Dr.A.R.Aryasri, TMH, New Delhi.
2. Management Science, 1/e, 2009, Dr. G. Sreenivasa Rao, High tech Publishers, Hyderabad.
3. Management Science, 3/e, 2008, A.R.Aryasri, TMH, New Delhi.
4. Introduction to Management Science, 1/e, 2011, P.Vijaykumar, Cengage Learning India, New Delhi
5. Managerial Economics, Analysis, Problems and Cases, 17/e, 2011, P.L.Mehta, Sultan Chand & Sons, New Delhi.

6.Marketing Management, 4/e, 2010, RajanSaxena, TMH, New Delhi.

7.Personnel and Human Resource Management, 2009, Subba Rao, HPIL.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	2	-	2	-	-	-	-	-
CO2	-	2	-	2	2	-		-	-	-	-	-
CO3	-	-	-	-		-	2	-	-	-	-	-
CO4	-	-	-	-	2	-		-	-	-	-	-
CO5	3	1	-	-	2	-	2	-	2	-	-	2
CO*	3	1.5	2	2	2	-	2	-	2	-	-	2

II B.Tech I Semester

18EEE214	**PRINCIPLES OF ELECTRICAL ENGINEERING**	**L**	**T**	**P**	**C**
		2	**1**	**0**	**3**

Course Educational objectives:

1. To acquire the knowledge on DC and AC transients.

2. To impart the knowledge on two port networks.

3. To acquire the knowledge on filters and attenuators.

4. To attain the knowledge on D.C. machines.

5. To acquire the knowledge on transformers and single phase ac machine.

UNIT 1- TRANSIENT ANALYSIS (9Hr)

Transient response of RL, RC, RLC Series circuits for D.C. excitation & sinusoidal excitation – Initial conditions – solution method using differential equations and Laplace transforms response of RL and RC networks to pulse excitation.

UNIT 2 -TWO PORT NETWORKS (9Hr)

Two port network parameters - Z, Y, ABCD and hybrid and g- parameters and their relations. Concept of transformed network-two port network parameters using transformed variables - cascaded networks.

UNIT 3 –FILTERS & SYMMETRICAL ATTENUATORS (9Hr)

Filters - Constant K Low pass filter, High pass filter - m derived T section - band pass filter and band elimination filter - Symmetrical Attenuators - type Attenuators, π Type Attenuators, Bridged T type Attenuator, Lattice Attenuators.

UNIT-4- DC MACHINES (9Hr)

Principle of Operation of DC Generator, Types of DC Generator, EMF Equation in DC Generator - OCC of a DC Shunt Generator - Principle of Operation of DC Motor -Types of DC Motors - Torque Equation - Losses and Efficiency Calculation in DC Motors, Speed control of DC Shunt motor - Swinburne's Test and Brake Test

UNIT-5-TRANSFORMERS AND SINGLE PHASE AC MACHINE (9Hr)

Principle of Operation - Constructional Details - Losses and Efficiency - Regulation of Transformer - Testing: O.C and S.C Tests. Working principle of single phase and three phase induction machine. Applications of AC machines.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course, students will be able to:		POs related to COs
CO1	Demonstrate knowledge onDC and AC transients	PO1
CO2	To determine and analyze different two-port networks	PO1, PO3
CO3	Design and solve the problem on filters and attenunators	PO1, PO2,PO3,PO5
CO4	Demonstrate knowledge on Construction and performance of DC motor and Analyze Losses and Efficiency of motor by different methods	PO1, PO2, PO4,PO5
CO5	Demonstrate knowledge on Construction and performance of transformer and design of the parameters of equivalent circuit of single phase transformer	PO1, PO2, PO4,PO5

TEST BOOKS:

1. Electrical and Elecronics Technology-By Huges-Pearson Eductoin
2. Introduction to Electrical Engineering- M.S.Naidu and S.Kamakshaiah, 2008, TMH.

REFERENCE BOOKS:

1.Theory and Problems of Basic Electrical Engineeing by D.P.Kothari&I.J.Nagrath PHI.

2.Principles of Electrical Engineering- A.Sudhakar, ShyammohanS.palli, 3rdedition, 2009, TMH.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	3	-	-	-	-	-	-	-	-	-
CO3	1	3	3	-	3	-	-	-	-	-	-	-
CO4	1	2	-	3	3	-	-	-	-	-	-	-
CO5	1	2	-	3	3	-	-	-	-	-	-	-
CO*	**1.6**	**2.33**	**3**	**3**	**3**	-	-	-	-	-	-	-

II B.Tech I semester

18ECE211	**ELECTRONIC DEVICES AND CIRCUITS**	**L**	**T**	**P**	**C**
		2	**1**	**0**	**3**

Course Educational Objectives:

1. To study the basic concepts and characteristics of the electronic devices and circuits.
2. To understand the operation of Rectifiers &Filters as application of PN junction diode.
3. This course discusses on the current flow across the p-n junction that contributes to the characteristics of the diodes, BJTs and FETs.
4. Consequently, the characteristics of these devices determine the performance of the electronic circuits.
6. The FETs covered in this course are the JFET, D-MOSFET and E-MOSFET and special purpose diodes.

UNIT-I: Junction Diode Characteristics (9Hr)

Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance. Zener diode – V-I Characteristics.

UNIT-2: Rectifiers and Filters (9Hr)

Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT-3: BJT Transistor Characteristics: (9Hr)

Junction transistor, transistor current components, transistor configurations, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through.

Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, self bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S, S', S''), Bias compensation.

UNIT-4: FET Transistor Characteristics: (9Hr)

Construction and principle of operation and characteristics of JFET & MOSFET (Enhancement & Depletion mode)**.** Biasing of FET, FET act as voltage variable resistor, comparison of BJT and FET

UNIT-5: Special Semiconductor Devices (9Hr)

Principle of operation, characteristics and applications of - Varactor diode, Tunnel diode, Uni Junction Transistors, Silicon Controlled Rectifier, Scottky diode, LED, Photo transistor.

Total Hours (45Hr)

Course Outcomes

On successful completion of the course, students will be able to		POs related to COs
CO1	Analyze the concepts and characteristics of the electronic devices and circuits.	PO1, PO2
CO2	*Examine*the operation of Rectifiers & Filters and its application.	PO1,PO2,PO3
CO3	Design and investigate the working of BJT and biasing techniques.	PO1,PO2,PO3,PO4
CO4	Design and analyze the working of FET, MOSFET and special diodes.	PO1, PO2,PO3,PO4
CO5	Demonstrate knowledge on special devices and their VI characteristic analysis	PO1, PO2

TEXT BOOKS :

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

REFERENCES :

1. Electronic Devices and Circuits-K. Satya Prasad, VGS Book Links.
2. Electronic Devices and Circuits-Salivahanan, Kumar,Vallavaraj, Tata Mc-Graw Hill, Second Edition
3. Electronic Devices and Circuits, David Bell, Oxford Press.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2**	**2**	-	-	-	-	-	-	-	-

II B.Tech I semester

18ECE212	SIGNALS AND SYSTEMS	L	T	P	C
		2	1	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the concepts and techniques associated with the understanding of signals and systems.
2. To familiarize the concepts of transform based continuous time and discrete time analysis of signals and systems
3. To provide fundamental knowledge about sampling process
4. To describe and Analyse Signal Transmission Through Linear Systems, and to familiarize the Ideal characteristics of LPF, HPF and BPF
5. To provide a foundation to the courses like communication, digital signal processing, control systems, instrumentation, and so on, that deals with signal and system concepts directly or indirectly

UNIT - 1: SIGNALS & SYSTEMS: (9Hr)

Definition and classification of Signals and Systems (Continuous time and Discrete time), Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals. Linear Time-Invariant Systems - Discrete-Time LTI Systems- The Convolution Sum, Continuous-Time LTI Systems - The Convolution Integral, Properties of Linear Time-Invariant Systems.

UNIT - 2:
FOURIER SERIES & FOURIER TRANSFORM: (9Hr)

Fourier series: Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Properties of CT Fourier Series, Trigonometric Fourier Series and Exponential Fourier Series with examples.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of CT Fourier Transform, Systems characterized by Linear constant coefficient differential equations.

UNIT - 3: DISCRETE TIME FOURIER TRANSFORM: **(9Hr)**

DTFT - Definition, properties of Discrete Time Fourier Transform for different types of signals.

SAMPLING THEOREM:

Sampling theorem for lowpass signals, Effect of Under sampling (Aliasing effect), Nyquist sampling rate & Problems.

UNIT - 4: SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS: (9Hr)

Linear system, impulseresponse, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time.

UNIT - 5: **(9Hr)**

LAPLACE TRANSFORM:

Laplace transform, Concept of ROC & properties, Properties of Laplace Transform, Laplace transform of different signals and Inverse Laplace Transform.

Z–TRANSFORM: Z- Transform, Concept of ROC & properties, Properties of Z-Transform, Z-Transform for different signals, Inverse Z-Transform and Comparison between FT, LT and ZT

Total Hours (45Hr).

Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate the concepts of signals and systems, Analyze the signals and apply different operations on signals.	PO1, PO2
CO2	Determine Fourier series coefficient for different types of signals.Evaluate Fourier Transforms for different types of continuous time signals.	PO1,PO2
CO3	Evaluate Fourier Transform pairs for different types of discrete time signals.Analyze sampling process and sampling of discrete time signals	PO1, PO2
CO4	Analyse Signal Transmission Through Linear Systems and to describe the Ideal characteristics LPF, HPF and BPF	PO1, PO2
CO5	Evaluate Laplace transforms with their properties by using the concept of ROC. Determine Z transforms with their properties by using the concept of ROC and relate with Laplace transform.	PO1, PO2

Text Books:

1. Linear Systems and Signals, B. P. Lathi, Second Edition, Oxford Univesity press.
2. Signals and Systems,A.V. Oppenheim, A.S.Willsky and S.H.Nawab, Pearson, 2nd Ed.,.
3. Signals and Systems, Ramakrishna Rao,2008, TMH.

References books:

1. Simon Haykin and Van Veen, “Signals & Systems”, Wiley, 2nd Edition.
2. B.P. Lathi, “Signals, Systems & Communications”, 2009, BS Publications.
3. Michel J. Robert, “Fundamentals of Signals and Systems”, MGH International Edition.
4. C. L. Philips, JNTU.M.Parrand Eve A.Riskin,“Signals, Systems and Transforms”, Pearson education.3rd Edition.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	-	-	-	-	-	-	-	-	-	-

II B.Tech I Semester

18ECE 213 SWITCHING THEORY AND LOGIC DESIGN

L	T	P	C
2	1	0	3

Course Educational Objectives:

1. To Provide Knowledge On
- Fundamentals of Digital logic design, Different Types Of Number Systems
- Conversions Of Number Systems,Arithmetic And Logical Operations,Weighted And Non Weighted Codes.
- Differences between Boolean And Ordinary Algebra and Minimization Of Switching Functions Using Boolean Algebra.

2. To develop skill to minimize swithching functions in effective way using K-MAP
3. To develop skill to design combinational logic circuits and realize the design using PLD's.
4. To provide knowledge on memory elements and develop skill to design sequential circuits.
5.To develop the skill to design and analyse finite state machines of different models.

UNIT-1: NUMBER SYSTEMS & CODES (9Hr)

Review of Number Systems- Binary Arithmetic-Subtraction with r and (r-1)'s Complements- Weighted & Non Weighted Codes- Error Detection and Error Correction Codes- Hamming Code.
Boolean Algebra : Boolean Theorems-Basic Logic Operations (NOT,OR,AND)-Complement and Dual of Logical Expressions- Universal Gates- EX-OR & EX-NOR Gates- Standard SOP and POS-Minimization of Logic Functions using Theorems.

UNIT- 2: MINIMIZATION OF SWITCHING FUNCTIONS (9Hr)

Minimization of Switching Functions using K-Map upto 6 variables- Minimal SOP and POS Realization-Problem Solving using K-Map for Boolean Functions in SOP and POS Forms.

UNIT -3: COMBINATIONAL LOGIC CIRCUITS & PLD'S (9Hr)

Design of Half Adder - Full Adder - Half Subtractor- Full Subtractor- 4-Bit Binary Adder-4-Bit Adder Subtractor- BCD Adder-Carry Look Ahead Adder -Magnitude Comparator – Decoder- Encoder-Multiplexer – De Multiplexer.

PLDS:

PROM – PLA – PAL ,Realization of Switching Functions using PROM - PLA and PAL - Comparison of PROM, PLA, and PAL.

UNIT-4: SEQUENTIAL CIRCUITS-I (9Hr)

Classification of Sequential Circuits (Synchronous And Asynchronous)-Basic Latches & Flip Flops-SR,D,JK,T –Conversion between Flip Flops- Design of Synchronous and Asynchronous Counters-Design of Shift Registers-Universal Shift Register.Design of Synchronous and Asynchronous Counters.

UNIT-5: SEQUENTIAL CIRCUITS –II (9Hr)

Finite State Machine - Capabilities and Limitations- Analysis of Clocked Sequential Circuits-Design Procedures- Reduction of State Tables and State Assignment-Realization of Circuits Using Various Flip flops - Mealy and Moore State Machines.Introduction to ASM Charts with Examples.

Total Hours (45Hr)

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on types and conversion of number systems, Error Detection and Error Correction arithmetic and logical operations of different radix and applying boolean algebra for switching functions reduction.	PO1, PO2
CO2	Identify the most efficient grouping to minimize the switching functions using k-map.	PO1,PO2
CO3	Design the combinational logic circuits and realize the PLD's for given specifications.	PO1,PO2,PO3
CO4	Understand the knowledge on latches and flip flops and design the sequential logic circuits.	PO1,PO2,PO3
CO5	Analyze and design finite state machines of different models by implementing state tables and state diagrams and Become familiarize with ASM.	PO1,PO2,PO3,PO4

Text books:

1. Digital Design, Morris Mano, 3/e,Prentice Hall of India, New Delhi, 2006.
2. Digital Fundamentals, ThomasL.Floyd, 10/e,Pearson/Prentice Hall, New Delhi, 2008.

Reference books:

1. Fundamentals of Logic Design, Charles H.Roth, 5/e, Thomas Publications, New Delhi, 2004.
2. Switching & Finite Automata Theory, ZviKohavi, 2/e, Tata McGraw Hill, NewDelhi.
3. Digital Systems Principles and Applications, Ronald J.Tocci Neal S.widmer, 8/e, Pearson Education, New Delhi, 2002.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2.3**	**2**	-	-	-	-	-	-	-	-

II B.Tech I semester

18ECE214	**ELECTRONIC DEVICES AND CIRCUITS LAB**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Course Educational Objectives:

1. To understand the functionality & specifications of basic electronic passive components.
2. To know the functionality & specifications of electronic active components and special devices.
3. To study the operation of Analog and digital meters which are used for practical experiments.
4. To provides soldering practice of basic electronic circuits for projects.
5. To know the practical knowledge of diodes and transistors with their input-output characteristics.

PART A:

Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B:

List of Experiments

1. P-N Junction Diode Characteristics (Silicon and Germanium).
2. Zener Diode Characteristics as a Voltage Regulator.
3. Rectifier (without and with filter).
4. BJT Characteristics (CE & CB Configuration).
5. FET Characteristics (Drain and Transfer).
6. SCR Characteristics.
7. UJT Characteristics.

Equipment required for Laboratory

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on identification & testing of passive components along with active devices.	PO1
CO2	Analyze the practical characteristics of diodes and transistor with different configurations	PO2
CO3	Design Simple electronic circuits by soldering with specifications	PO3
CO4	Analyze the special purpose devices with their characteristics for future applications	PO4
CO5	Implement the devices like LED, LDR, Photo diode etc. for society applications	PO6
CO6	Follow ethical principles on analysis of different electronic circuits which is used for project works.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to electronic devices and their applications during their life time	PO12

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	-	3	-	3	3	**3**	**-**	**3**

II B.Tech I semester

18EEE215 PRINCIPLES OF ELECTRICAL ENGINEERING LAB

L	T	P	C
0	0	2	1

Course Educational Objectives:

1. To gain practical experience on fundamental RL and RC circuits.
2. To gain practical experience on different two port networks.
3. To evaluate the performance characteristics of DC shunt generator
4. To evaluate the efficiency of DC shunt machine
5. To evaluate the performance characteristics and speed control of DC shunt motor
6. To evaluate the efficiency of single- phase transformer

.

List of Experiments:

1. Time Response of First Order RL And RC Circuits
2. Determine Z (Impedance) Parameters of a given Two-Port Network
3. Determine Y (Admittance) Parameters
4. Determine ABCD (Transmission Parameters) of a given Two-Port Network
5. Determine The H (Hybrid) Parameters
6. Determine The G Parameters
7. Magnetization Characteristics of D.C Shunt Generator Determination of Critical Field Resistance.
8. Swinburne's Test of DC Shunt Machine.
9. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
10. OC & SC Tests on Single- Phase TransformerTo Find The Efficiency.
11. Regulation of Single- Phase Transformer.
12. Speed Control of Dc Motor.

Course Outcomes:

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on the fundamental concepts of transient response of systems.	PO1
CO2	Identify and Analyze the Parameters of Two-Port Network and DC Generators & Motors.	PO2
CO3	Design of Two port networks for attaining solution through different parameters.	PO3
CO4	Investigate Two-Port Networks and for solve complex problems related.	PO4
CO5	Follow the ethical values in designing the circuits.	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO8	Continue updating their design skill related to for various circuits based on application during their life time	PO12

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	3	3	3	3	-	-	-	3	3	3	-	3

II B.Tech I Semester

		L	T	P/D	C
18AUD212	**ENVIRONMENTAL SCIENCE (Common to All Branches)**	**2**	**-**	**-**	**-**

Course Educational Objectives:

1. To study the nature and facts about environment.
2. To finding and implementing scientific, technological, economic and political solutions to environmental problems.
3. To study the interrelationship between living organism and environment.
4. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
5. To study the dynamic processes and understand the features of the earth's interior and surface.
6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT – 1: INTRODUCTION TO ENVIRONMENTAL SCIENCE AND NATURAL RESOURCES (9Hr)

Introduction: Definition - Scope and importance of environment - Need for public awareness - Natural Resources: Forest resources: Use and over-exploitation - Deforestation - Conservation of forests. **Mineral resources:** Use and exploitation - Environmental effects of extracting mineral resources - Case studies. **Energy resources:** Conventional energy resources - Natural gas and Nuclear fuels - Non-conventional energy resources - Solar energy - Wind energy - Tidal energy - Geothermal energy and Biogas energy - Use of alternate energy sources - Case studies.

UNIT – 2: ECOSYSTEM AND BIODIVERSITY (9Hr)

Ecosystem: Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem - Food chains - Food webs - Ecological pyramids - Types - Characteristic features - Structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (Ponds - Streams - Lakes - Rivers - Oceans - Estuaries). **Biodiversity:** Introduction to biodiversity - Genetic - Species and Ecosystem diversity - Value of biodiversity: Consumptive value - Productive value - Social value - Ethical value - Aesthetic and Option values - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – 3: POLLUTION AND WASTE MANAGEMENT (9Hr)

Definition - Causes - Effects - Control measures of pollution. **Air Pollution:** Types of pollutants - Their sources and impacts - Air pollution control. **Noise Pollution:** Impacts of noise - Permissible limits of noise pollution - Measurement of noise - Control of noise pollution. **Soil Pollution:** Causes of soil degradation - Excessive use of fertilizers - Problems with pesticide use - Excess salt and water. **Solid waste management:** Characteristics - Generation - Collection and transportation of solid wastes - Engineered systems for solid waste management (reuse, recycle, energy recovery, treatment and disposal).

UNIT – 4: SOCIAL ISSUES AND THE ENVIRONMENT (9Hr)

Water conservation measures - Rain water harvesting and water shed management - Resettlement and rehabilitation of people - Its problems and concerns - Case studies - Role of NGO's - Climate change - Global warming (Green house effect) - Ozone layer depletion - Acid rain - Nuclear accidents. **Sustainable development:** Definition - Objectives - Environmental dimensions of sustainable development.

UNIT– 5: ENVIRONMENTAL LEGISLATION AND HUMAN POPULATION (9Hr)

Environmental acts: The water (Prevention and control of pollution) Act - The air (Prevention and control of pollution) act - The wild life (protection) act - The forest conservation act - The environmental protection act. **Case studies:**Chipko movement - Narmada bachaoandolan - Silent valley project - Chernobyl nuclear disaster - and Bhopal gas tragedy. **Population growth:** Variation among nations - Population explosion - Value education - HIV/AIDS - Role of information technology in environment and human health - Case studies.

Field Work:

Visit to a local area to document environmental assets: River/ Forest/ Grasslands/ Mountains
Visit to local polluted site: Urban/ Rural/ Industrial/ Agriculture
Study of simple ecosystems: Pond/ River/ Hill slope etc.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on fundamentals of Environment.andAnalyze the availabity of non-conventional energy resources.	PO1, PO2,PO6, PO7,PO8,PO9 PO12
CO2	Identify appropriate types of habitates in the surrounding and analyze the influence of habitats on survivial.	PO1, PO2 PO7,PO8, PO12
CO3	Identify appropriate method of controlling of pollution and design the ecofriendly techniques	PO1, PO2, PO6, PO7, PO8, PO12
CO4	Analyze the effect of climatic changes	PO1, PO2,PO6,PO7 PO8, PO12
CO5	Understand the population growth and variation- environmental acts	PO1, PO2,PO6, PO7, PO8, PO12

Text Books:

1. Text book of Environmental Studies, 4/e, 2012, C.P. Kaushik and AnubhaKaushik, New Age International (P) Ltd., Publishers, New Delhi.
2. Text book of Environmental Studies, 1/e, 2008, ErachBharucha, University Press (India) Private Ltd. Hyderabad.

Reference Books:

1. Environmental Studies-From Crisis to Cure, 2/e, 2012, R. Rajagopalan, Oxford University Press , New Delhi.
2. A Text Book of Environmental science and Technology ,1/e, 2008, Dr.M.Anji Reddy, B.S. Publications, Hyderabad.
3. Principles of Environmental Science and Engineering, 1/e, 2005, Keerthinarayana and Daniel Yesudiam, Hi –Tech Publications , Chennai.
4. Glimpses of Environment , 1/e, 2005, Dr. KVSG Murali Krishna, Environmental Protection Society, Kakinada, India.
5. Environmental Studies, 1/e, 2009, AninditaBasak , Pearson Education, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	2	3	3	1	-	-	3
CO2	3	3	-	-	-	-	2	1	-	-	-	3
CO3	3	3	-	-	-	3	1	3	-	-	-	3
CO4	3	3	-	-	-	3	3	3	-	-	-	3
CO5	3	3	-	-	-	3	3	3	-	-	-	3
CO*	**3**	**3**	**-**	**-**	**-**	**2.7**	**2.4**	**2.6**	**1**	**-**	-	**3**

II B.Tech I Semester

		L	T	P/D	C
18SAH212	**REASONING AND APTITUDE - I**	**2**	**-**	**-**	**-**

Course Educational Objectives:

1. To apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.

REASONING AND APTITUDE

Numbers and fractions – LCM and HCF – Simplification and roots – Averages – Percentages – Ratios and proportions – Profit and loss – Partnership and shares – Simple and compound interest – Series (Verbal) – Coding and decoding – Blood relations – Venn diagrams – Problems on ages – Directions – Assertion and reasoning – Logarithms – Syllogism.

Course Outcomes:

On successful completion of the course, students will be able to:		**POs related to COs**
CO1	Apply the mathematical concepts in real life problem solving methodologies.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10,PO11, PO12
CO2	Apply the reasoning knowledge in real life problem solving methodologies.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10,PO11, PO12

Text Books:

1. Quantitative Aptitude, Dr.R.S.Aggarwal, 2012, S.Chand and Company Ltd, New Delhi.
2. A Modern Approach to Verbal and Non-Verbal Reasoning, Dr.R.S.Aggarwal, 2012, S.Chand and Company Ltd, New Delhi.

Reference Books:

1. Quantitative Aptitude for Competitive Examinations, AbhijitGuha, 14/e, 2010, Tata McGraw Hill Publishers, New Delhi.
2. Course in Mental Ability and Quantitative Aptitude, Edgar Thorpe, 3/e, 2012, Tata McGraw Hill Publishers, New Delhi.
3. Fast Track Objective Arithmetic, Rajesh Verma, 2012, Arihant Publications, Meerut.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO*	3	3	3	3	3	3	3	3	3	3	3	3

II B.Tech II Semester

18SAH221	**ENGINEERING MATHEMATICS – IV (COMMOM TO ECE, EEE)**	**L**	**T**	**P**	**C**
		2	**1**	**0**	**3**

Course Educational Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and Techniques that are essential for an engineering course.
2. To provide knowledge on
- Gamma,Beta functions and complex functions in single variable
- Continuity, differentiability of complex functions
- Mapping of complex functions
- Integral of complex function and its applications

3. To learn Gamma and Beta functions, their properties and applications will beintroduced and to analyse the functions of complex variable with a review of elementary complex functions.
4. To learn continuity, differentiability and analyticity of a complex function
5. To learn conformal mapping of complex functions and to understand the Taylor and Laurent expansion with their use in finding out the residue and improper integral
6. To learn complex integration and applications to real integrals

UNIT - 1: Special Functions & Complex Functions I (9Hr)

Bessel Function - Generating function (without proof) - Recurrence Relations - Orthogonally.

Functions of a complex variable - Elementary functions: Exponential - Trigonometric - Hyperbolic - Logarithmic functions and their properties - Principal value

UNIT - 2: Complex Functions II (9Hr)

Continuity - Differentiability - Analyticity – Properties - Cauchy-Riemann equations in Cartesian and polar coordinates - Harmonic and conjugate harmonic functions - Milne-Thompson method.

UNIT - 3: Conformal mapping and Bilinear Transformation (9Hr)

Conformal Mapping: Definitions - Transformation by e^z, lnz, z^2, sin z, cosz - Translation - Rotation - Inversion and Bilinear transformation - Fixed point - Cross ratio - Determination of bilinear transformation.

UNIT - 4: Complex Integration and Complex Power Series (9Hr)

Complex Integration: Line integral - Evaluation along curves and closed contours - Cauchy's integral theorem - Cauchy's integral formula - Generalized Cauchy's integral formula.
Complex Power Series: Taylor's and Laurent series expansions of complex functions - Singular point - Isolated singular point - Pole of order m - Essential singularity.

UNIT - 5: Residue Calculus (9Hr)

Residue - Evaluation of residue by formula - Residue theorem - Evaluation of integrals using residue theorem - Evaluation of improper and real integrals of the type

(a) $\int_{-\infty}^{+\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$ (c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ **Total Hours (45Hr)**

Course Outcomes:

On successful completion of this course, the student will be able to		POs related to COs
CO1	Demonstrate knowledge in Gamma, Beta functions and theory of functions of one complex variable develop analytical skills in providing solutions for problems involving real integrals using Gamma ad Beta functions	PO1,PO2
CO2	Demonstrate knowledge in continuity and differentiability of a complex function and write Cauchy-Riemann equations to describe the analyticity of complex functions	PO1,PO2
CO3	Demonstrate knowledge in conformal mappings and bilinear transformations and develop skills in analyzing the properties exhibited by complex functions in Argand plane	PO1,PO2
CO4	Demonstrate knowledge in integration of complex functions and develop analytical skills in providing solutions for problems involving integration of complex functions and develop skills in analyzing the properties of complex functions by expressing them in power series	PO1,PO2
CO5	Develop analytical skills in providing solutions for problems involving improper real integrals and develop skills in analyzing properties of improper integrals through residue theory	PO1,PO2

Text Books:

1. Engineering Mathematics – III, 2013, T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad , S. Chand and Company Publishers, Delhi.
2. Higher Engineering Mathematics, 34/e, 1999, Dr. B. S. Grewal, Khanna Publishers, Delhi

Reference Books:

1. Engineering Mathematics for JNTU, 3/e, 2008, B.V. Ramana, Tata McGraw Hill Publishers, New Delhi.
2. Theory and Applications of Complex Variables, 1981, Murray R. Spiegel, Schaum's outline series, McGraw-Hill Book Company, Singapore.
3. Higher Engineering Mathematics, Dr. M. K. VenkataRamana, National Pub , Madras.
4. A Text Book of Engineering Mathematics, 2011, N.P.Bali, Laxmipublications(P)Ltd, New Delhi.
5. Engineering Mathematics, Volume – III , 2013, E. Rukmangadachari, E. Keshava Reddy, Pearson Education, Chennai.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	-	-	-	-	-	-	-	-	-	-

II B.Tech II semester

18ECE221	**ELECTRONIC CIRCUIT ANALYSIS**	**L**	**T**	**P**	**C**
		2	**1**	**0**	**3**

Course Educational Objectives:

1. To develop the basic understanding of amplifier designing and its analysis using hybrid model
2. To make students aware of amplifier operation at low and high frequency and its frequency responses.
3. To make students learn about different types of feedback amplifiers and oscillators
4. To Analyze the power efficiency calculations of power amplifiers
5.To make students learn about different types of Tuned amplifiers

UNIT- 1: Small Signal Low Frequency BJTTransistor Amplifier Models (9Hr)

Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

UNIT-2: Small Signal High Frequency Transistor Amplifier models (9Hr)

Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

UNIT-3: Multistage Amplifiers (9Hr)

Classification of amplifiers, methods of coupling, Cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier.

UNIT-4: Feedback Amplifiers and Oscillators (9Hr)

Feedback Amplifiers:

Feedback principle, types of feedback, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

Oscillators:

Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT.

UNIT-5: Power Amplifiers and Tuned Amplifiers (9Hr)

Power Amplifiers:

Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

Tuned Amplifiers : Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, effect of cascading single tuned amplifiers on band width, effect of cascading double tuned amplifiers on band width, staggered tuned amplifiers, stability of tuned amplifiers, wideband amplifiers.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Analyze the various parameters of multi-stage amplifiers and its frequency response	PO1, PO2
CO2	Analyze the frequency response of BJT at high frequency	PO1, PO2,PO4
CO3	Analyze the various parameters of Feedback amplifiers and frequency of oscillation for audio and radio frequency oscillators	PO1, PO2,PO4
CO4	Analyze of power efficiency calculations of power amplifiers	PO1, PO2,PO4
CO5	Understand the different types of tuned amplifiers and Q factor	PO1, PO2,PO4

Text Books:

1. Integrated Electronics – J. Millman and C.C. Halkias, McGraw-Hill, 1972.
2. Electronic Devices and Circuits - Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

Reference Books :

1. Introductory Electronic Devices and Circuits – Robert T. Paynter, Pearson Education, 7th Edition
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006.
3. Micro Electronic Circuits – Sedra A.S. and K.C. Smith, Oxford University Press, 5th ed.
4. Electronic Circuit Analysis and Design – Donald A. Neaman, McGraw Hill.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	2	-	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	-	**2**	-	-	-	-	-	-	-	-

II B.Tech II semester

		L	T	P	C
18ECE222	**PULSE AND DIGITAL CIRCUITS**	**2**	**1**	**0**	**3**

Course Educational Objectives:

1. To provide knowledge on linear network responses for different signals

2. To develop knowledge on non-linear networks for different applications(operations)

3. To develop a skill on analysis and design of different switching devices and different logic families and their characteristics

4. To develop different circuits that produce non-sinusoidal waveforms(Multivibrator) and their applications

5. To provide knowledge on different time base generators and its applications

UNIT - 1: LINEAR WAVE SHAPING (9Hr)

High pass and Low pass RC circuits- their response for sinusoidal, step, pulse, square and ramp inputs, RC network as differentiator and integrator, Attenuators and its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT - 2: NON LINEAR WAVE SHAPING (9Hr)

Diode clippers- clipping at one & two independent voltage levels with Transfer characteristics, Transistor clippers, Emitter coupled Clipper, Comparators and applications of voltage comparators, clamping operation, classification of clamping circuits using diode. Clamping circuit theorem

UNIT - 3: SWITCHING DEVICES AND DIGITAL LOGIC CIRCUITS (9Hr)

Diode as a switch, Transistor as a switch, transistor switching times, Design of transistor Switch, Realization of Logic gates (basic gates and universal gates) using DTL, RTL and TTL, ECL, CMOS logic Circuits, Comparision of logic families, Basic operation of Sampling gates and its Applications.

UNIT - 4: MULTIVIBRATORS (9Hr)

Astable Multivibrator: Analysis and Design of collector coupled AstableMultivibrators, Application of Astable Multivibrator as Voltage to Frequency converter.

Monostable Multivibrator: Analysis and Design of collector coupled MonostableMultivibrators, Application of monostable Multivibrator as Voltage to time converter.

Bistable Multivibrator: Analysis and Design of collector coupled Fixed bias, Self biasBistableMultivibrators, Commutating capacitors, Methods of triggering using RC network & diode, Emitter coupled Bistable Multivibrator (**Schmitt Trigger**).

UNIT - 5: TIME BASE GENERATORS (9Hr)

General Features of a Time Base Signal, Methods of Generating Time Base Waveform, UJT relaxation oscillator, Miller And Bootstrap Time Base Generators: Basic Principles, Transistorised Miller and Bootstrap Time Base Generators, Current Time Base Generator.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Analyse the different linear networks for different input signals	PO1, PO2,PO3
CO2	Analyse the different nonlinear networks for different applications	PO1, PO2, PO3,
CO3	Demonstrate design knowledge on diode , transistor switching and design concept of different logic families with different characteristics	PO1, PO2, PO3,
CO4	Able to Identify appropriate Multivibrator circuit based on application	PO1, PO2, PO3,
CO5	Capable to Identify appropriate time base circuit based on the application in display devices	PO1, PO2, PO3

Text books :

1. Pulse, Digital and Switching Waveforms, 3/e,1991, J. Millman and H. Taub, McGraw-Hill,NewDelhi.
2. Solid State Pulse circuits, 4/e., 2002, David A. Bell, PHI, New Delhi.

References books:

1. Pulse and Digital Circuits , 2 /e,2009,A. Anand Kumar, PHI,New Delhi.
2. Pulse, Digital Circuits and Computer Fundamentals, 3/e,1997, R.Venkataraman, DhanpatRaiPublications,New Delhi
3. Pulse and Digital Circuits,3/e,2006, Prof B.N. Yoga Narasimhan,Shiva book Publishers, Bangalore.
4. Pulse and Digital Circuits ,3 /e,2006,Syed Amjad Ali, Hi-Tech Publishers,Hyderabad.
5. Pulse and Digital Circuits, 1/e, 2011,U.A.Bakshi, A.P.Godse, Technical Publications,Pune.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-

II B.Tech. II semester

18ECE223 PROBABILITY THEORY & STOCHASTIC PROCESS

L	T	P	C
2	1	0	3

Course Educational Objectives:

1. To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in signal processing and Communication Engineering.
2. To introduce students to the basic methodology of "probabilistic thinking" and to apply it to problems;
3. To understand basic concepts of probability theory and random variables, how to deal with multiple random variables, Conditional probability and conditional expectation, joint distribution and independence, mean square estimation..

UNIT-1: Probability (9Hr)

Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces,Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.

UNIT-2: Random Variables (9Hr)

Definition of random variable, Conditions to be a random variable, Types of random variables- Continuous, Discrete & Mixed, PDF, CDF & properties, Conditional PDF and properties, Monotonic and Non monotonic Transformation of random variables – Continuous & Discrete.

UNIT-3: Statistical Parameters of Single & Multiple Random Variables Operations on Single Random Variables: (9Hr)

Moment about origin, Central moments, Characteristic function (CF), Moment Generating Function (MGF), Calculation of statistical parameters for Binomial, Poisson, Uniform, Gaussian, Exponential & Rayleigh random variables.

Operations on Multiple Random Variables:

Joint PDF & CDF, Marginal PDF & CDF, Conditional PDF &CDF, Statistical independence, Joint moment about origin, Central moment, Joint Characteristic function (CF), Joint Moment Generating Function (MGF), Calculation of statistical parameters for multiple random variables, Sum of two random variable & Central limit theorem.

UNIT-4: Stochastic Process – Temporal characteristics (9Hr)

Concept of stochastic process, PDF & CDF of stochastic process, Time averages, Statistical averages, Classification of stochastic process- Deterministic, Non deterministic, Concepts of stationary - strict sense, Wide sense &Ergodicity. Correlation- auto correlation and its properties, cross correlation & properties.

UNIT-5: Stochastic Process Spectral characteristics & LTI System with Random inputs (9Hr)

Stochastic Processes – Spectral Characteristics: Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum and its Properties, Band pass, Band limited, Narrow band pass process.

LTI System with Random inputs - Response of LTI System to Statistical Averages – Mean, Mean square, Correlation & PSD.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate the basic knowledge of Probability theory	PO1, PO2
CO2	Demonstrate the concepts of random variable and its types & properties. Analyze Monotonic and Non–Monotonic transformations of random variables	PO1,PO2
CO3	Estimation of Statistical Parameters for single random variables and multiple random variables. Representation of random variables for both continuous and discrete form(PDF & CDF)	PO1, PO2, PO4
CO4	Demonstrate the concepts of Stochastic process and its classification such as wide sense & ergodocity random process. Determine cross correlation and auto correlation	PO1, PO2
CO5	Determine PSD. Evaluate relation between auto correlation and cross correlation .Finding the response of mean,mean square and correlation	PO1, PO2

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Probability Theory and Stochastic Processes, Mallikarjunareddy, Golden era publications,Guntur.1/e 2010.

REFERENCE BOOKS:

1. Theory of Probability and Stochastic Processes – Pradip Kumar Ghosh, University Press.
2. Probability and Random Processes with Applications to Signal Processing – Henry Stark and W. Woods, Pearson Education, 3rd Edition.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

II B.Tech II semester

		L	T	P	C
18ECE224	**ELECTROMAGNETIC FIELDS AND WAVES**	**2**	**1**	**0**	**3**

Course Educational objectives:

1. To provide the basic skills required to understand, develop and design various Engineering applications involving Electromagnetic Fields.
2. To lay the foundation of Electromagnetism and its practice in modern Communication Systems.

UNIT -1:ELECTROSTATICS-I (9Hr)

Review of Vector algebra- Co-ordinate systems & transformation-Vector calculus-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 - Maxwell's Two Equations for Electrostatic Fields - Electric dipole - Energy Density, Illustrative Problems.

UNIT-2: ELECTROSTATICS-II (9Hr)

Convection and Conduction Currents-Dielectric Constant - Isotropic and Homogeneous Dielectrics - Continuity Equation - Relaxation Time - Poisson's and Laplace's Equations - Capacitance – Parallel Plate – Coaxial - Spherical Capacitors, Illustrative Problems.

UNIT -3:MAGNETOSTATICS (9Hr)

Biot-Savart Law - Ampere's Circuital Law and Applications - Magnetic Flux Density - Maxwell's Two Equations for Magnetostatic Fields. Magnetic Scalar and Vector Potentials - Forces due to Magnetic Fields - Magnetic torque and moment - Magnetic dipole - Inductances and Magnetic Energy - Magnetization in materials - Magnetic Boundary condition - Inductors and Inductance- Magnetic Energy - Magnetic Circuits, Illustrative Problems.

UNIT -4:MAXWELLS EQUATIONS (FOR TIME VARYING FIELDS) (9Hr)

Faraday's Law and Transformer E.M.F - Inconsistency of Ampere's Law and Displacement Current Density - Maxwell's Equations in Different Final Forms and Word Statements - Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

UNIT -5:EM WAVE CHARACTERISTICS & PROPAGATION (9Hr)

Wave Equations for Conducting and Perfect Dielectric Media-Uniform Plane Waves – Definition - All Relations between E & H - Sinusoidal Variations - Wave Propagation in Lossless and Conducting Media - Conductors & Dielectrics – Characterization - Wave Propagation in Good Conductors and Good Dielectrics – Polarization - Reflection and Refraction of Plane Waves – Normal and Oblique Incidences - for both Perfect Conductor and Perfect Dielectrics - Brewster Angle - Critical Angle and Total Internal Reflection - Surface Impedance - Pointing Vector and Pointing Theorem - Applications - Power Loss in a Plane Conductor, Illustrative Problems.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Analyze and solve the problems of electric fields that vary with three dimensional spatial co-ordinates as well as with time.	PO1, PO2, PO4
CO2	Analyze the convection, conventional currents, Poisson and Laplace equations. Design various capacitor models.	PO1, PO2, PO3
CO3	Analyze and solve the problems of magnetic fields that vary with three dimensional spatial co-ordinates as well as with time.	PO1, PO2, PO4
CO4	Get the knowledge and ability to apply the Maxwell's Equations to various field waves and at different boundaries.	PO1, PO2, PO4
CO5	Understand and analyze the propagation of electromagnetic waves in different media.	PO1, PO2

Text Books:

1. Elements of Electromagnetics, Matthew N.O. Sadiku, 4 /e. Oxford Univ. Press, 2008.
2. Engineering Electromagnetics,William H. Hayt Jr. and John A. Buck, 7/ e, TMH, 2006.

Reference Books:

1. EM Waves and Radiating Sys. E.C. Jordan and K.G. Balmain, 2/e,PHI,2000.
2. Electromagnetics,John D. Krauss, 3/e, McGraw- Hill publications, 1988.
3. Electromagnetics, Schaums Outline Series,2/e, TMH publications, 2006.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

II B-Tech II semester

18ECE225	**COMPUTER ARCHITECTURE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Educational Objectives:

1. To Acquire Knowledge on the basic structure and operation of a digital computer.
2. To discuss in detail the operation of the arithmetic unit including the algorithms of addition, subtraction, multiplication & division.
3. To Analyze and understand the architecture of 8086 Microprocessor and its pin configuration.
4. To Analyze and understand the concept of Timing diagrams and Different instructions of 8086
5. To develop assembly language programming skills on 8086 processor using different instruction sets.

UNIT-1: BASIC STRUCTURE OF COMPUTERS (9Hr)

Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance, Register Transfer language, Register Transfer, Bus and memory transfer, Arithmetic Mircrooperatiaons, logic micro operations, shift micro operations.

UNIT-2: COMPUTER ARITHMETIC (9Hr)

Computer Registers, Computer instructions–Instruction cycle, Addition and subtraction, multiplication Algorithms, Division Algorithms, Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-3: INTRODUCTION TO 8086 MICROPROCESSOR (9Hr)

8085 Overview, 8086 Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration, Minimum and Maximum Mode Signals.

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UNIT-4: 8086 TIMING DIAGRAMS & INSTRUCTION SET (9Hr)

Physical Memory Organization, General Bus Operation-, Timing Diagrams - Interrupts Of 8086,Instruction Formats -Addressing Modes-Instruction Set,Assembler Directives-Macros.

UNIT-5: PROGRAMMING WITH 8086 MICROPROCESSOR& INTERFACING DEVICES (9Hr)

Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions – String Manipulations-Simple ALPs, 8255 PPI- Block Diagram, Various Modes of Operation,Interface D/A and A/D interfacing.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on fundamentals of Computer functional units and types of computers, Analyze the importance of register transfer, arithmetic, logical and shift operations.	PO1, PO2
CO2	Be familiar with the basic registers, instruction set and Algorithm Design for arithmetic bit level operations.	PO1, PO2,PO3
CO3	Understand the basic organization of 8086 Microprocessor with the knowledge of Pin Diagram, registers.	PO1, PO2
CO4	Analyze the timing diagrams for minimum and maximum mode and addressing modes, instructions of 8086 processor.	PO1,PO2
CO5	Be familiar with instruction set and assembly language programming using 8086 processor.	PO1,PO2,PO3, PO4

TEXTBOOKS:

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson.
2. Advanced microprocessor and Peripherals ,A,K,Ray and K,M,Bhurchandi,2nd edition, TMH, New Delhi,2000
3. Computer Organization – CarlHamacher, ZvonksVranesic, SafwatZaky, V Edition, McGraw Hill.

REFERENCE BOOKS:

1. Micro Processors &Interfacing ,Douglas U, Hall,revised 2nd edition,TMH,New Delhi,2007.
2. The 8088 and 8086 microprocessors, Walter A,Triebel, Avtar Singh, 1st edition, PHI, New Delhi,2003.
3. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson,
4. 8085 Microprocessor and its applications by A.Nagoorkani, 3rd edition, Tata MC Grawhill publications.
5. Computer Architecture and Organization – John P. Hayes, McGraw Hill International.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**	2	-	-	-	-	-	-	-	-

II B.Tech II semester

18ECE226	**ELECTRONIC CIRCUIT ANALYSIS LAB**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Course Educational Objectives:

1. Obtain the frequency response of amplifiers with and without feedback
2. Understand the design considerations of amplifiers with and without feedback
3. Understand the design considerations of oscillators namely, RC phase shift and LC oscillators for a given frequency of oscillations
4. Understand the conversion efficiency of large signal amplifiers, Class A and Class B.
5. Understand the design considerations of single tuned amplifiers.

List of Experiments:(Minimum of Ten Experiments has to be performed)
Part –A: Hardware

1. Determination of f T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9.Class A Series-fed Power Amplifier
10.Transformer-coupled Class A Power Amplifier
11.Class B Push-Pull Power Amplifier
12.Complementary Symmetry Class B Push-Pull Power Amplifier
13.Single Tuned Voltage Amplifier

Part –B: Using MULTISIM Software Tool

1. Determination of f T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9.Class A Series-fed Power Amplifier
10.Transformer-coupled Class A Power Amplifier
11.Class B Push-Pull Power Amplifier
12.Complementary Symmetry Class B Push-Pull Power Amplifier
13.Single Tuned Voltage Amplifier

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on Small , large signal amplifier and oscillators	PO1
CO2	Analyze the simulated results of various amplifiers and oscillators	PO2
CO3	Design and testing the amplifiers and oscillators in the hardware	PO3
CO4	Conduct investigation and test the functionality on implementation of amplifiers and oscillators	PO4
CO5	Select appropriate tools as Multisim PSPICE simulation package tool and procedure to simulate and implement amplifiers and oscillators	PO5
CO6	Follow ethical principles in designing, simulating and implementing circuits.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to implementation for various application during their life time	PO12

Equipment required:

Software:

1. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
2. Computer Systems with required specifications

Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

CO-PO Mapping

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	3	-	-	3	3	**3**	**-**	**3**

II B.Tech II semester

		L	T	P	C
18ECE227	**PULSE AND DIGITAL CIRCUITS LAB**	**0**	**0**	**2**	**1**

Course Educational Objectives:

1. To provide knowledge on responses of different linear and non linear circuits for various input signals
2. To develop a design skill on transistor switch
3. To develop skill on different logic gates with different logics.

4. To provide a design knowledge and analysis of different multi-vibrators and Schmitt trigger

5. To in inculcate design skill on different sweep circuits

Minimum Ten(10) experiments to be Conduct.

1. Linear wave shaping (RC Differentiator and RC Integrator)
2. Non Linear Wave Shaping – Clippers
3. Non Linear Wave Shaping – Clampers
4. Transistor as a switch
5. Verify the truth tables of basic gates and universal gates using DTL.
6. Astable Multivibrator,
7. Monostable Multivibrator
8. Bistablemultivibrator
9. Schmit Trigger
10. UJT relaxation oscillator
11. Boot strap Sweep Circuit
12. Miller Swep Circuit

Equipments Required for Laboratory:

1. Regulated Power Suplly : 0-30V
2. Cathode Ray Oscilloscope: 0-20MHz
3. Function Generator: 0-1MHz
4. Multimeters.
5. Components.

Course Outcomes:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Demostrate knowledge on using different circuits for different applications	PO1
CO2	Analyze the output waveforms for the designed circuits	PO2
CO3	Design and develop the different circuits based on the requirement in digital circuits	PO3
CO4	Investigate and test the circuits for produces required outputs	PO4
CO5	Select appropriate design tools to test the different circuits for different values	PO5
CO6	Follow the ethical values in designing the circuits.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their design skill related to for various circuits based on application during their life time	PO12

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	3	-	-	3	3	**3**	**-**	**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Semester

18ECE228	**ONLINE COMPREHENSIVE TEST-I**	L	T	P/D	C
		2	-	-	1

Course Educational Objectives:

1. To assess the comprehensive knowledge gained in basic courses relevant to the branch of study.
2.To comprehend the questions asked and answer them with confidence.

On-line Comprehensive Test:

On-line comprehensive test will be conducted at the end of the II year II semester with 100 objective questions (multiple choice questions) for 100 marks on the courses studied in the respective semesters (II year I semester and II year II semester).

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Understand and comprehend any given problem related to mechanical engineering field.	PO1,PO2,PO3,PO4, PO5,PO6, PO7, PO8, PO9,PO10,PO11,PO12
CO2	The students will be confident in discussing the fundamental aspects of any engineering problem/situation and give answers in dealing with them.	PO1,PO2,PO3,PO4, PO5,PO6, PO7, PO8, PO9,PO10,PO11,PO12

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO*	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

II B.Tech II Semester

18AUD211	**CONSTITUTION OF INDIA**	L	T	P/D	C
		2	-	-	-

Course Educational Objectives:

1. To know about Indian constitution and functionalities of state and central government of India
2. To realize the functions of local administration in rural and urban areas
3. To understand the functions of Chief election and state election commissions.

UNIT – 1: INTRODUCTION (9Hr)

Constitution-meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT – 2: UNION GOVERNMENT AND ITS ADMINISTRATION (9Hr)

Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha

UNIT – 3: STATE GOVERNMENT AND ITS ADMINISTRATION (9Hr)

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT – 4: LOCAL ADMINISTRATION (9Hr)

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT – 5: ELECTION COMMISSION (9Hr)

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Total Hours (45Hr)

Course Outcomes

On successful completion of the course the student will be able to		POs related to COs
CO1	Understand the functions of the Indian constitution	PO6, PO8,PO12
CO2	Recognize the structure, functions of Indian central government	PO6, PO8,PO12
CO3	Realize the structure and functions of State government in India	PO6, PO8,PO12
CO4	Explain the functions of local administration in rural and urban	PO6, PO8,PO12
CO5	Understand the role of state and chief election commission	PO6, PO8,PO12

Textbooks:

1. Introduction to the Constitution of India,Durga Das Basu, Prentice Hall of India, New De1hi.
2. Indian Po1itica1 System, R.C.Agarwa1,S.Chand and Company, New De1hi.1997

Reference Books:

1. Introduction to the Constitution of India, Sharma, Brij Kishore, Prentice Hall of India, New De1hi.
2. Indian Po1itica1 System, U.R.Gahai, New Academic Pub1ishing House, Jalandar.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO2	-	-	-	-	-	3	-	3	-	-	-	3
CO3	-	-	-	-	-	3	-	3	-	-	-	3
CO4	-	-	-	-	-	3	-	3	-	-	-	3
CO5	-	-	-	-	-	3	-	3	-	-	-	3
CO*	-	-	-	-	-	3	-	3	-	-	-	3

II B.Tech II Semester

18SAH223	**REASONING AND APTITUDE - II**	**L**	**T**	**P/D**	**C**
		2	**-**	**-**	**-**

Course Educational Objectives:

1. To apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.

REASONING AND APTITUDE

Time and work – Pipes and cistern – Time, distance and speed – Problems on trains – Boats and streams – Allegations / mixture – Permutations and combinations – Probability – Logarithms – Analogy – Classifications – Completion of incomplete patterns – Area, surface area and volume – Heights and distances – Calendars' based problems – Clocks – Data interpretation (tabulation- line graphs, bar graphs, pie charts) – Data sufficiency.

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Apply the mathematical concepts in real life problem solving methodologies.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10,PO11, PO12
CO2	Apply the reasoning knowledge in real life problem solving methodologies.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10,PO11, PO12

Text Books:

1. Quantitative Aptitude, Dr.R.S.Aggarwal, 2012, S.Chand and Company Ltd, New Delhi.
2. A Modern Approach to Verbal and Non-Verbal Reasoning, Dr.R.S.Aggarwal, 2012, S.Chand and Company Ltd, New Delhi.

Reference Books:

1. Quantitative Aptitude for Competitive Examinations, AbhijitGuha, 14/e, 2010, Tata McGraw Hill Publishers, New Delhi.
2. Course in Mental Ability and Quantitative Aptitude, Edgar Thorpe, 3/e, 2012, Tata McGraw Hill Publishers, New Delhi.
3. Fast Track Objective Arithmetic, Rajesh Verma, 2012, Arihant Publications, Meerut

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO*	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

III Year B.Tech I semester	L	T	P	C
	2	1	0	3

18ECE311 ANALOG COMMUNICATIONS

Course Educational Objectives:

1. To provide knowledge on
- Principle of basic communication system
- Modulation in time & frequency domain
- Generation and detection of Amplitude Modulation

2. To develop skills and describe different types of amplitude modulation schemes.
- Evaluate analog modulated waveforms time/frequency domain and also calculation of power..

3 . To introduce the concepts of angle modulations and their spectral characteristics.

4. To understand the concepts of Multiplexing & pulse modulation schemes,
- Introduce the techniques of transmitters and receivers

5. To Understand noise as a random process and its effect on communication receivers.
- Compare the performance of AM, FM and PM schemes with reference to SNR

UNIT - 1 : AMPLITUDE MODULATION (9Hr)

Introduction to communication system & its elements, Modulation and Need for modulation, Amplitude Modulation, Time domain and Frequency domain description, single tone modulation, Power relations in AM waves, Generation of AM: Square law modulator, Switching & Transistor Modulators, Detection of AM: Square law detector and Envelop detector, Applications of AM.

UNIT – 2: DSB, SSB AND VSB MODULATION (9Hr)

Time domain and Frequency domain description, Power relations of DSB, SSB, Generation of DSB-Balanced modulator, Ring modulator, Detection of DSB: Coherent detection, Costas loop, Envelope detection. Generation of SSB: Phase description, Frequency Discrimination method, Demodulation of SSB. Generation of VSB: Phase & Frequency Discrimination method, Demodulation of VSB and Applications of DSB, SSB & VSB.

UNIT – 3: ANGLE MODULATION (9Hr)

Basic Concepts, Frequency Modulation: Single tone modulation in Time domain and frequency domain description, Narrow Band FM, Wide Band FM with Bessel function, Power relations of FM, Carson's rule, Comparison between NBFM & WBFM, Generation of FM waves: Direct FM, Detection of FM: simple slop, balanced slop, Foster seeley, Ratio, PLL detection, Improvement of SNR: Pre-emphasis & De-emphasis, Phase Modulation, Comparison between AM, FM & PM.

UNIT – 4: TRANSMITTERS & RECEIVERS (9Hr)

Frequency Division Multiplexing (FDM), Generation and Degeneration of PAM, PWM & PPM system, Transmitters: AM Transmitter- Low level& High level Modulation, FM Transmitter, Receivers: Sensitivity, Selectivity, Fidelity, AM Receiver: Tuned Radio Frequency(TRF) receiver, Super Heterodyne Receiver(SHR), Image frequency & its rejection ratio, AGC, FM Receiver.

UNIT– 5: NOISE PERFORMANCE (9Hr)

Introduction - classification, figure of merit, Noise in DSB and SSB system, Noise in AM system: Square law and Envelope detection-Small and Large noise case – Threshold effect, Noise in Angle Modulation: FM, PM systems.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Demonstrate **knowledge** on principle of communication system, **formulate** the power relations of AM and understand the different type of modulation and demodulations.	PO1, PO2.
CO2	**Analyze** the different types of amplitude modulation schemes with AM, **formulate** the power relations of DSB, SSB, VSB and solve the analog modulation **problems**,	PO1, PO2, PO3.
CO3	**Analyze** the performance of analog modulation schemes, **evaluate** time /frequency domain waveforms and also find modulation index. **Calculate** bandwidth and power requirements for FM, PM.	PO1, PO2, PO3.
CO4	Understand the different characteristics of transmitter and receivers and **analyze** the pulse analog modulation systems.	PO1, PO2.
CO5	**Analyze** the different types of noise and predict its effect on various analog communication systems and **Formulate** the SNR & figure of merit for AM, FM, PM.	PO1, PO2, PO4.

Text books:

1. Communication Systems, 3/e , 1996,Simon Haykins, John Willey,New Delhi.
2. Modern digital and analog Communication systems, 3/e, 2005, B. P. Lathi, Oxford University press, New Delhi.

Reference books:

1. An Introduction to Analog and Digital Communication, 2/e, 2003, Simon Haykins, John Wiley, New Delhi.
2. Principles of communication, 3/e, 2008, H. Taub and Schilling McGraw Hill, Noida.
3. Communication Systems, 2/e, 2004, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, New Delhi.
4. Communication Systems: Analog and Digital Communication, 1/e, 1995, R.P Singh and S.D Sapre, McGraw Hill, Noida.
5. Analog Communications, 2/e, 2008, KN Hari Bhat & Ganesh Rao, Pearson Publications, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	3	-	-	-	-	-	-	-	-
CO*	3	2.6	3	3	-	-	-	-	-	-	-	-

III Year B.Tech I semester	L	T	P	C
	2	1	0	3

18ECE312 LINEAR AND DIGITAL IC APPLICATIONS

Course Educational Objectives:

1. To introduce the basic building blocks of linear integrated circuits and linear and non - linear applications of operational amplifiers.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To know the theory of ADC and DAC.
4. To introduce the concepts of waveform generation and introduce some special function ICs.
5. To understand and implement the working of basic digital circuits, CPLDs and FPGAs

UNIT-1: BASICS OF OPERATIONAL AMPLIFIER (9Hr)

Op-amp Block Diagram- Differential Amplifier-Configurations, ideal and practical Op-amp specifications- DC and AC characteristics- 741 op-amp & its features -Op-Amp parameters- Frequency Compensation technique.

Inverting -Non-inverting amplifier- and Difference amplifier- Integrator and differentiator- Instrumentation amplifier- AC amplifier- V to I- I to V converters- Buffers.

UNIT-2: NON-LINEAR APPLICATIONS OF OP- AMPS (9Hr)

Non- Linear function generation- Comparators- Multivibrators- Triangular and Square wave generators- Log and Anti log amplifiers- Precision rectifiers, Voltage Regulators.

Introduction to active filters- Butter worth filters – 1st order, 2^{nd} order- LPF- HPF filters. Band pass- Band reject and all pass filters.

UNIT-3: SPECIAL ICs & DATA CONVERTERS (9Hr)

Introduction to 555 timer- functional diagram- Monostable and Astable operations and Schmitt Trigger, VCO and PLL (IC565), AD633 Analog multiplier IC

Introduction- basic DAC techniques- weighted resistor DAC- R-2R ladder DAC- Different types of ADCs - counter type ADC- successive approximation ADC and dual slope ADC. DAC and ADC Specifications.

UNIT-4: CMOS LOGIC (9Hr)

Introduction to logic families- CMOS logic- CMOS steady state electrical behavior- CMOS dynamic electrical behaviour- CMOS logic families.

BIPOLAR LOGIC AND INTERFACING

Bipolar logic- Transistor logic- TTL families- CMOS/TTL interfacing- low voltage CMOS logic and interfacing- Emitter coupled logic - Familiarity with standard 74XX and CMOS 40XX series-ICs.

UNIT-5: CPLDs and FPGAs: (9Hr)

Complex Programmable Logic Devices - Xilinx XC9500 CPLD Architecture Block, I/O and Switch matrix - Field-Programmable Gate Arrays - Xilinx XC4000 FPGA Family – CLB, I/O Block and Programmable Interconnect, Memory programmable FPGAs-SRAM, Applications of FPGAs.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Understand the basics of operational amplifiers with linear integrated circuits along with its characteristics	PO1, PO2
CO2	Analyze the non-linear applications of op-amp and design active filters using ICs.	PO1,PO2, PO3
CO3	Investigate the working principles of special ICs and data converters	PO1, PO2,PO3,PO4
CO4	Understand the electrical behaviour of CMOS logic, bipolar logic and interfacing.	PO1, PO2
CO5	Gain the knowledge on principle of operations and applications of digital circuits, CPLDs and FPGAs	PO1, PO2

TEXT BOOKS :

1. Op-Amps & Linear ICs, 4th Edition, 1987, Ramakanth A. Gayakwad,PHI,New Delhi.
2. Digital Design Principles & Practices, 3rd Ed., 2005, John F. Wakerly, PHI/ Pearson Education Asia, New Delhi.

REFERENCES:

1. Linear Integrated Circuits, 2nd Edition, 2003, D. Roy Chowdhury,New Age International (p) Ltd,Mumbai.
2. Linear IC and Applications, U.A.Bakshi and A.P.Godse,Technical Publications, Pune 1st ed., 2005.
3. Digital System Design Using VHDL, 2nd edition, 2008, Charles H. Roth Jr., PWS Publications, New Delhi.
4. Fundamentals of Digital Logic with VHDL Design, 2nd Edition. 2005, Stephen Brown and Zvonko Vramesic, McGraw Hill, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	2.8	2.4	2	2	-	-	-	-	-	-	-	-

III Year B.Tech I semester

L	T	P	C
2	1	0	3

18ECE313 VLSI DESIGN

Course Educational Objectives:

1. To provide knowledge on
- Fundamentals of Fabrication Process
- Super integration concepts
- .Fabrication of NMOS,PMOS ,CMOS AND BICMOS

2. To develop skill to analyze electrical properties of MOS transistor

3. To develop skill to design sticks diagrams and layout diagrams for MOS transistors, contacts and wires.

4. To inculcate skill to investigate the effect of floor planning, placement, routing and power delay estimation in physical design of digital circuits and memory design..

5. To develop skill to apply the concept of Combinational and Sequential Circuit Testing.

UNIT - 1: VLSI TECHNOLOGY (9Hr)

Fabrication sequence - process flow – Oxidation - Lithography Techniques - Diffusion process - Ion implantation – Metallization – Encapsulation – Testing - Super integration concepts - Integrated Passive components - MOS Resistors and capacitors – Crossovers - NMOS - PMOS - CMOS – BICMOS fabrication processes – comparison

UNIT - 2: BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS (9Hr)

Drain to source current (I_{ds}) versus Drain to source voltage (V_{ds}) relationships - MOS transistor threshold voltage (V_t) – MOS transistor transconductance g_m and output conductance g_{ds} - figure of merit (ω_0) - pass transistor- pull – up to pull – down ratio.

UNIT - 3: VLSI CIRCUIT DESIGN PROCESSES (9Hr)

VLSI design flow - Stick diagram design rules with examples - Design rules for Layout diagrams of digital circuits - sheet resistance R_s - standard unit of capacitance - Inverter delays - Propagation delays - Wiring capacitance - Inverter Design aspects .- scaling of MOS circuits - limitations of scaling.

UNIT - 4: PHYSICAL DESIGN: (9Hr)

Floor Planning – Placement – Routing - Power Delay Estimation - Clock and Power Routing.

VLSI DESIGN STYLES:

Full Custom – Semi custom – Standard Cells - Gate Arrays - FPGAs - CPLDs –Design of memory –SRAM-DRAM

UNIT - 5: VLSI TESTING: (9Hr)

Test Principles-BIST-Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Identify appropriate method and design of NMOS,PMOS, CMOS AND BICMOS and obtain relation of electrical properties of mos transistor.	PO1, PO2
CO2	Demonstrate knowledge on fundamentals of fabrication process and Super integration concepts	PO1, PO2,PO4
CO3	Identify appropriate layout and stick diagrams for MOS transistors ,wires and contacts	PO1, PO2, PO3, PO5
CO4	Analyze the effect of floor planning ,routing, placement and power delay estimation and design of Standard cells and memory design	PO1, PO2, PO3,PO4
CO5	Understand and use the concept of Combinational and Sequential Circuit Testing and design verification of circuits.	PO1, PO4,.

Text Book:

1. Basic VLSI Design, Douglas, 3rd Edition, A. Pucknell, Kamran Eshraghian, PHI, New Delhi, 2011.
2. Modern VLSI design, Wayne Wolf, 3rdEdition, Pearson Education, New Delhi, 4th impression 2008.

Reference Books:

1. Introduction to VLSI Circuits and Systems, John .P. Uyemura, John Wiley, Student Edition, New Delhi, Reprint 2006
2. Application Specific Integrated Circuits, Michel John Sebastian Smith, Addison Wesley, Indian Edition, 4th Indian Reprint 2001, New Delhi.
3. Introduction to VLSI design, International Edition, Eugine D. Fabricus, Mc Graw Hill, New Delhi.
4. VLSI Technology, S.M. SZE, 2nd Edition, , Bell Laboratories, TMH, New Delhi,2003.
5. Principles of CMOS VLSI Design, N.H.E Weste, K.Eshraghian, Adisson Wesley, 2nd Edition, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	3	-	-	-	-	-	-	-	-
CO3	3	2	3	-	3	-	-	-	-	-	-	-
CO4	2	3	2	2	-	-	-	-	-	-	-	-
CO5	2	-	-	3	-	-	-	-	-	-	-	-
CO*	2.6	2.75	2.5	2.66	3	-	-	-	-	-	-	-

III Year B. Tech I Semester	L	T	P	C
	2	1	0	3

18ECE314 ADVANCED MICROPROCESSOR AND MICROCONTROLLERS

Course Educational Objective:

1. To understand programmable peripheral devices and their Interfacing with I/O devices.

2. To Acquire the knowledge on Serial communications and advanced processors.

3. To provide knowledge on

- Architecture of 8051,Memory
- Addressing modes
- Instruction set

4. To understand about PIC microcontroller and its instruction set

5. To Analyze the ARM Processor and its operating modes

UNIT-I: 8086 INTERFACING (9Hr)

Assembly Language programming on 8086,Overview on 8255(PPI), Intel 8259 programmable interrupt controller, Intel 8257 DMA controller, 8279 keyboard interfacing, alphanumeric displays 7-segment display.

UNIT-II: SERIAL COMMUNICATIONS AND ADVANCED MICROPROCESSORS (9Hr)

Programmable Communication Interface (8251) USART, Architecture and Description of Operating Modes, Features of 80386 and 80486 processors.

UNIT-III: Intel 8051 MICROCONTROLLER and ASSEMBLY LANGUAGE PROGRAMMING (9Hr)

Architecture, hardware concepts, external memory, counters/timers, interrupts, addressing modes & instruction set, simple programs.

UNIT-IV: PIC MICROCONTROLLER (9Hr)

Background of PIC, characteristics of PIC microcontroller, PIC 16F877 architecture, memory organization, parallel and serial input and output, Interrupts, instruction set of the PIC 16F877.

UNIT- V: INTRODUCTION TO ARM PROCESSORS: (9Hr)

Background of ARM and ARM architecture, Introduction to ARM Cortex M3 processor, fundamental registers, Memory organization, Operating modes.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Able to understand programmable peripheral devices and their Interfacing	PO1, PO2, PO3.
CO2	Able to understand serial communicatons and advanced versions of the processors.	PO1,PO2,PO3,PO4,PO5
CO3	Becomes skilled in 8051 microcontroller and its programming	PO1, PO2, PO3.
CO4	Analyze in detail about PIC microcontroller and its instruction set	PO1, PO2, PO3.
CO5	Understand ARM processor and its various operating modes	PO1,PO2

TEXT BOOKS:

1. Advanced microprocessor and Peripherals, A, K, Ray and K, M, Bhurchandi, 2nd edition, TMH, New Delhi, 2000.
2. The 8051 Microcontroller, Kenneth j.Ayala, 3rd edition, Thomson Delmar Learning, Asia Pvt.Ltd.
3. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, PIC Microcontroller and Embedded Systems: Using C and PIC18, Pearson Education, 2008.

REFERENCE BOOKS:

1. Micro Processors & Interfacing, Douglas U, Hall, revised 2nd edition,TMH,New Delhi,2007.
2. The 8088 and 8086 microprocessors, Walter A,Triebel, Avtar Singh, 1st edition, PHI, New Delhi,2003.
3. Microcomputer Systems the 8086/8088 Family: Architecture Programming and Design", Liu & Gibson, 2nd edition, PHI, New Delhi.
4. The 8086 microprocessor programming and interfacing, KennethJ,Ayala, 1/e, Cenange learning private limited, New Delhi, 2007.
5. Microprocessors and microcontrollers, Krishna Kanth, 2nd edition, PHI learning, New delhi,
6. Joseph Yiu, The Definitive Guide to the ARM Cortex-M3 & M4, Elsevier, 3rd Edition, 2013.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	2	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2	2	2	2	-	-	-	-	-	-	-

III Year B. Tech I semester	L	T	P	C
	2	1	0	3

18ECE315 TRANSMISSION LINES AND WAVEGUIDES

COURSE EDUCATIONAL OBJECTIVES

1. To provide the knowledge on the transmission lines.

2. To analyze transmission line problems using smith charts.

3. To provide the knowledge on Microwave spectrum and its importance

4. To analyze the different fields of wave guides

5. To develop the skills with waveguide bench setup for Microwave measurements.

UNIT-1: TRANSMISSION LINES – 1 (9Hr)

Transmission Lines Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Distortion – Condition for Distortion less and Minimum Attenuation, Loading - Types of Loading.

UNIT-2: TRANSMISSION LINES – 2 (9Hr)

Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR, UHF Lines as Circuit Elements; $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Significance of Z_{min} and Z_{max}, Smith Chart – Configuration and Applications, Single and Double Stub Matching.

UNIT-3: WAVEGUIDES & MICROWAVE TRANSMISSION LINES (9Hr)

Introduction to Microwave Spectrum and Bands - Applications of Microwaves - Rectangular Waveguides - Solution of Wave Equation In Rectangular Coordinates - TE/TM Mode Analysis - Expressions for Fields - Characteristic Equation and Cutoff Frequencies - Filter Characteristics - Dominant and Degenerate Modes - Mode Characteristics - Phase And Group Velocities - Wavelengths and Impedance Relations. Rectangular Waveguides: Power Transmission and Power Losses - Impossibility Of TEM Modes - Cavity Resonators – Introduction - Rectangular And Cylindrical Cavities - Dominant Modes And Resonant Frequencies - Illustrative Problems.

UNIT-4: WAVEGUIDE COMPONENTS (9Hr)

Coupling Mechanisms – Probe – Loop - Aperture Types - Wave Guide Discontinuities - Waveguide Windows - Tuning Screws And Posts - Matched Loads - Waveguide Attenuators - Waveguide Phase Shifters – Wave Guide Multiport Junctions - E Plane And H Plane Tees - Magic Tee - Directional Couplers, Isolators and Circulators, S-Parameters - Illustrative Problems.

UNIT-5: MICROWAVE MEASUREMENTS WITH WAVEGUIDES (9Hr)

Description of Microwave Bench - Different Blocks and Their Features - Errors and Precautions - Microwave Power Measurement - Measurement of Attenuation - Frequency -Standing Wave Measurements – Measurement of Low And High VSWR.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	**Analyze** a transmission line and its constants	PO1, PO2
CO2	**Design** a transmission line to get required output impedance	PO1, PO2, PO3
CO3	**Understand** and **analyze** various fields of a rectangular waveguide.	PO1, PO2
CO4	**Analyze** and **design** various parameters related to microwave Wave guide components	PO1, PO2,PO3
CO5	**Design** a microwave bench setup for measuring purpose	PO1, PO2,PO3, PO4

TEXT BOOKS

1. Matthew N.O. Sadiku, "Elements of Electromagnetics," Oxford Univ. Press, 4th ed., 2008.
2. Microwave and Radar Engineering, 3rd Edition, 2003, M. Kulakarni, Umesh Publications, New Delhi.

REFERENCE BOOKS

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems"PHI, 2nd Ed., 2000.
2. Y.Mallikarjuna Reddy, "Electromagnetic Waves and Transmission Lines" Universities Press.
3. G. S. N. Raju, "Electromagnetic Field Theory and Transmission Lines," Pearson education, 2013.
4. Microwave Devices and Circuits, 3 rd Edition, 2003, Samuel Y. Liao, Pearson, India.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	3	2.2	2	2	-	-	-	-	-	-	-	-

III Year B. Tech I semester	L	T	P	C
	2	1	0	3

18EEE313 CONTROL SYSTEMS

Course Educational objectives:

1. To demonstrate knowledge on physical systems and modelling of Electrical and Mechanical systems
2. To educate problem solving skills in block diagram reduction technique, signal flow graph Techniques and the state equations of a system
3. To analyze the stability of the system in Time and Frequency domains.
4. To introduce state variable representation of physical systems
5. To impart knowledge on compensators and evaluating controllability and observability of a system

UNIT I: MODELING OF CONTROL SYSTEMS (9Hr)

Control system and types - Effects of feedback - Differential equation model - Transfer Function model -Mathematical modelling of Electrical and Mechanical systems- Analogy between electrical and mechanical systems-Transfer Function of DC and AC Servo motor - Block diagram reduction technique – Signal flow graph.

UNIT II: TIME DOMAIN ANALYSIS (9Hr)

Standard test signals - Time domain specifications - Unit step response of First and second order systems - Time response specifications of second order systems - Steady state response - Steady state errors and error constants. Effects of proportional, integral, derivative Controllers, Design of P, PD, PI PID Controllers,

UNIT III: FREQUENCY DOMAIN ANALYSIS (9Hr)

Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots - Polar Plots-Nyquist Plots- Phase margin and Gain margin- Design of compensation Lag, Lead, Lead-Lag Compensators

UNIT IV: STABILITY ANALYSIS IN FREQUENCY DOMAIN (9Hr)

Concepts of stability - Necessary conditions for Stability - Routh- stability criterion - Stability and conditional stability More on the Routh stability criterion - root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT V: STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS (9Hr)

Concepts of state, state variables and state model, derivation of state models from Schematic models, differential equations, Transfer function, block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties. Concepts of

controllability and observability.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to		POs related to COs
CO1	Understand control system concepts, the use of differential equation and transfer function models for analyze physical systems.	PO1,PO2,PO3
CO2	Analyze the time response of systems and estimate the steady state errors.	PO1,PO2,PO3,PO4
CO3	Examine the open loop and closed–loop frequency responses of systems.	PO1,PO2,PO3,PO4
CO4	Design the compensators and analyze the stability of the system in time and frequency domains.	PO1,PO2,PO3,PO4
CO5	Explore the state variable representation of physical systems and controllability and observability.	PO1,PO2

TEXT BOOKS:

1. "Control Systems Engineering" – 5/e- I J Nagrath and M. Gopal -New Age International (P) Limited - Publishers.
2. "Modern Control Engineering" - 5 /e - 2010 by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd, New Delhi.

REFERENCE BOOKS:

1. "Automatic Control Systems" - 8 /e- 2003 reprint 2009 B. C. Kuo and Farid Golnaraghi – John wiley and son's -New Delhi .
2. "Control Systems" –1 /e- 2007 A. Anand Kumar, Prentice Hall of India Pvt. Ltd, New Delhi.
3. "Control Systems Engineering" - 6 /e - 2010 by Norman S NISE John wiley.
4. "Modern Control Engineering" - 1 /e- 2011 by Yaduvir Singh and S. Janardhan, Cengage Learning.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	2.5	2.66	-	-	-	-	-	-	-	-

III Year B.Tech I Semester	L	T	P	C
	0	0	2	1

18ECE316 IC APPLICATIONS LAB

Course Educational Objectives:

1. Gain the practical hands-on experience on 741 Op-Amp applications
2. Gain the practical hands-on experience on 555 timer applications
3. Gain the practical hands-on experience on Voltage Regulator
4. To construct and verify the combinational designs using digital ICs.
5. To construct and verify the sequential designs using digital ICs.

LIST OF EXPERIMENTS:

PART- A (LINEAR IC APPLICATIONS)

Minimum seven experiments to be conducted:

1. Study of OP AMPs - IC 741, IC 555, IC 565, IC 566, - functioning, parameters and specifications.
2. OP AMP Applications - Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications - LPF, HPF (first and second order).
5. Function Generator using OP AMPs.
6. a) IC 555 Timer - Monostable Operation Circuit.
   b) IC 555 Timer - Astable Operation Circuit.
7. IC 565 - PLL Applications.
8. Three Terminal Voltage Regulators - 7805, 7809, 7912.
9. 4 bit DAC using OP AMP.
10. Design and testing of precision Half wave and Full wave rectifiers using op-amps.

PART- B (DIGITAL IC APPLICATIONS)

Minimum 7 Experiments to be conducted using VHDL

1. Construct all gates using IC-74XX.
2. Construct and verify the functions of the following circuits using CMOS logic gates (Digital ICs):
   a. Half adder, Half Subtractor, b. Full adder, Full Subtractor
3. Construct the following circuits; check the outputs using multiplexer IC-74X151 and Demultiplexer IC-74X155.
4. Construct the following circuits and check the hardware generated logic output of 3-8 Decoder using IC-74138 and 8-3 Encoder using IC-74148.
5. Construct and verify logic output of the comparator using IC-74x85.
6. Construct and verify the logic output of a parity generator/Checker.
7. Construct and verify the functions of a D FLIP-FLOP.
8. Construct and verify functions of a counter using IC-74x90.
9. Construct and verify functions of the following:
   a. register b. shift register

COURSE OUTCOMES:

On successful completion of this course, the students will be able to		POs related to COs
CO1	Understand the functioning of Integrated circuits- IC741, IC555, IC565 and IC566	PO1
CO2	Analyze the functioning performance of linear and digital ICs	PO2
CO3	Gain the practical knowledge to design an electronic circuit using integrated chips	PO3
CO4	Conduct investigation for analyzing the integrated circuits performance in various applications	PO4
CO5	Follow ethical principles in analyzing and design the circuits	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the circuits.	PO10
CO8	Continue updating their skill and apply during their life time.	PO12

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	-	-	-	-	-	-	-	-	-	-	-
CO2	-	**3**	-	-	-	-	-	-	-	-	-	-
CO3	-	-	**3**	-	-	-	-	-	-	-	-	-
CO4	-	-	-	**3**	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	**3**	-	-	-	-
CO6	-	-	-	-	-	-	-	-	**3**	-	-	-
CO7	-	-	-	-	-	-	-	-	-	**3**	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	**3**

III Year B.Tech I semester	L	T	P	C
	0	0	2	1

18ECE317 ADVANCED MICROPROCESSOR AND MICROCONTROLLERS LAB

Course Educational Objectives:

1. To provide knowledge on
- Fundamentals of 8086 processor
- .Basic Arithmetic, logical operations.
- Fundamentals of Cross Assembler

2. To become skilled in 8086 assembly language programming.

3. To develop skill to understand programmable peripheral devices and their interfacing with Processor

4. To understand and learn 8051 microcontroller assembly language programming and its Interfacing

5. To learn basics of PIC Microcontroller programming

LIST OF EXPERIMENTS:

I. MICROPROCESSOR 8086:

1. Introduction to Cross Assembler /TASM
2. Arithmetic Operations, Multi byte Addition and Subtraction, Signed and Unsigned Arithmetic Operation, Factorial of given n-numbers.
3. Logic Operations-Shift Rotate-Converting Packed BCD to Unpacked BCD.
4. By using string operation and instruction prefix: move block, reverse string, Sorting of data in ascending and descending order.

II.INTERFACING

1. 8279-Keyboard display: write a small program to display a string of characters.
2. 8255- Interfacing with Traffic light controller
3. 8255-Interfacing with DAC to generate Triangular and Square waveform.

III.MICROCONTROLLER 8051:

1. Arithmetic operations using 8051 microcontroller(addition, subtraction, multiplication, division)
2. Logical operations using 8051 microcontroller

IV 8051 Interfacing & Programs using PIC Microcontrollers(perform any four programs)

1. Introduction to RTOS development board
   a) Write program to read input from switches.
   b) Write program to make LED's blink.
2. 7 -Segment display (multiplexed)
3. Stepper Motor Interface

4 Arithmetic operations using PIC microcontrollers

5. Logical operations using PIC microcontrollers
6. Bit manipulation operations using PIC microcontrollers

COURSE OUTCOMES:

On successful completion of this course, the students will be able to		POs related to COs
CO1	Develop testing and experimental procedures on 8086 microprocessor and analyze the operation under different cases.	PO1
CO2	Setup programming strategies and select proper mnemonics and run the program on the training boards.	PO2
CO3	Able to understand and work with microprocessor real time interfaces including digital to analog converters, stepper motors, analog to digital converters	PO3
CO4	Design and implement programs on 8051 and PIC microcontrollers	PO4
CO5	Able to interfacing circuits with RTOS development boards and understand the concept related to I/O devices.	PO5
CO6	Follow ethical principles in designing, simulating and implementing various circuits.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to semiconductors implementation for various application during their life time	PO12

EQUIPMENT REQUIRED FOR LABORATORY:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. 8255 PPI
10. LED, 7-Segemt Units
11. Digital Multimeters etc.
12. PIC Microcontroller kits

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	-	-	-	-	-	-	-	-	-	-	-
CO2	-	**3**	-	-	-	-	-	-	-	-	-	-
CO3	-	-	**3**	-	-	-	-	-	-	-	-	-
CO4	-	-	-	**3**	-	-	-	-	-	-	-	-
CO5	-	-	-	-	**3**	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	**3**	-	-	-	-
CO7	-	-	-	-	-	-	-	-	**3**	-	-	-
CO8	-	-	-	-	-	-	-	-	-	**3**	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	**3**

III Year B.Tech II semester	L	T	P	C
	2	1	0	3

18ECE321 DIGITAL COMMUNICATIONS

Course Educational Objectives:

1. To understand the functional block diagram of Digital communication system.
2. To understand the need for source and channel coding.
3. To study various source and channel coding techniques.
4. To understand a mathematical model of digital communication system for bit error rate analysis of different digital communication systems.

UNIT – 1: BASE BAND DATA TRANSMISSION-I (9Hr)

General block diagram of digital communication system, Analog to Digital conversion (ADC): Sampler, Quantizer- uniform, non-uniform & differential quantization, encoder, Pulse Code Modulation(PCM), Noise in PCM, Differential PCM(DPCM), Delta Modulation(DM), Adaptive DM(ADM) , Comparison between PCM, DPCM, DM & ADM.

UNIT – 2: BASE BAND DATA TRANSMISSION-II (9Hr)

TDM, Binary encoding & M -ary encoding, Calculation of PSD, Inter Symbol Interference(ISI), Nyquist criteria, Eye diagram, Probability of error in Binary encoding, Correlative coding , Duo binary signalling scheme, Base band Signal Receiver: Matched Filter and its properties, Correlation receiver.

UNIT – 3: SOURCE ENCODING & DECODING (9Hr)

Information, Entropy and it's Properties, Information Rate, Joint & Conditional Entropy, Mutual Information and its properties, Binary Symmetry Cannel – Binary Erasure Channel, Shannon Hartley theorem , Shannon Fano coding and Huffman coding .

Unit – 4: CHANNEL ENCODING AND DECODING (9Hr)

Linear block codes, Error detection & correction capabilities of linear block codes, Binary Cyclic Codes and its error detection & Correction capabilities, Convolution codes : Frequency domain Approach, tree diagram, State diagram, Trellis Diagram, Viterbi decoder.

Unit – 5: BAND PASS DATA TRANSMISSION (9Hr)

Binary ASK Modulator, Coherent & Non-Coherent Detection of ASK and its constellation diagram, Binary FSK Modulator, coherent & Non coherent Detection of FSK and its constellation diagram, Binary PSK Modulator, Coherent Detection of PSK and its constellation diagram, Differential Binary Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK): Modulator and Demodulator, QAM , Probability of Error for ASK, FSK, PSK .

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of course the students will be able to		POs related to COs
CO1	Demonstrate knowledge on difference between analog and digital communication system, Analyze the performance of base band digital modulation techniques, Formulate the SNR for PCM & DM systems.	PO1, PO2, PO3.
CO2	Understand the principle of multiplexing & base band digital modulation system, Analyze probability of error performance and design digital communication systems	PO1, PO2, PO3.
CO3	Understand the basics of information theory, analyze the mutual information & channel capacity with properties using entropy and Calculate/Formulate the transmission efficiency for Source encoding techniques.	PO1, PO2, PO4.
CO4	Know the difference between source coding, channel coding techniques such as block, cyclic and convolutional codes and apply their concepts in the analysis and design of digital communication systems	PO1, PO2, PO3, PO4.
CO5	Analyze and compare the Band pass digital modulation techniques design the constellation diagrams and calculate/formulate the probability error of all digital modulation techniques.	PO1, PO2, PO3, PO4.

TEXT BOOKS:

1. Digital communications, 2009, Simon Haykin, John Wiley,New delhi.
2. Digital and Analog Communicator Systems, 2005, Sam Shanmugam, John Wiley New delhi.

REFERENCE BOOKS:

1. Principles of communication, 3/e, 2008, H. Taub and Schilling, McGraw Hill, Noida.
2. Digital communications, 5/e, 2008,J G Proakis, McGraw Hill, New delhi.
3. Digital communications, 2/e, 2007, Bernard Sklar,Pearson edition, New delhi.
4. Digital Communications, 2/e, 2008,Ian A. Glover, Peter M. Grant, Edition, Pearson Edu. New delhi.
5. Communication Systems, 2006, B.P. Lathi, BS Publication, Hyderabad.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	3	2	2	2	-	-	-	-	-	-	-	-

III Year B-Tech II semester	L	T	P	C
	2	1	0	3

18ECE322 ANTENNA WAVE PROPAGATION

Course Educational Objectives:

1. To study the basic concepts & properties of Electro-Magnetism to obtain parameters of antennas and Wave Propagation
2. To inculcate the skills regarding mechanisms of Antenna arrays.
3. To Analyze the electric and magnetic field emission from various basic UHF antennas with Mathematical formulations.
4. To Analyze the electric and magnetic field emission from various basic VHF antennas with Mathematical formulations.
5. To study the wave propagation over ground, through troposphere and ionosphere; Diversity principles.

UNIT-1 ANTENNA FUNDAMENTALS (9Hr)

Antenna Basics: Physical concept of radiation, near and far field regions, basic antenna parameters: radiation patterns, beam area, radiation Intensity, beam efficiency, reciprocity, directivity and gain, antenna apertures, effective height, bandwidth, radiation efficiency, polarization, radio communication Link, antenna temperature and antenna field zones. Short electric dipole, fields of a short dipole, radiation resistance of dipole, Half wave dipole antenna.

UNIT-2 ANTENNA ARRAYS (9Hr)

Point Sources & their arrays: Arrays, Point source, Power theorem and its application, Examples of power patterns, Field patterns, Phase patterns, Array of isotropic point sources- different cases, non-isotropic sources, principle of pattern multiplication, linear arrays of n elements of equal amplitude & spacing, broad side, end fire arrays, radiation pattern, directivity, beam width and null directions, array factor, Directions of maxima, Linear broadside arrays with non-uniform amplitude distributions-general condition. Phased arrays, folded dipole antennas and Yagi-Uda Arrays.

UNIT-3 VHF- UHF AND MICROWAVE ANTENNAS-I (9Hr)

Loop, Slot, and Horn Antenna: Introduction, small loop, far fields of small loop, far field patterns of circular Loop, radiation resistance, directivity, slot antenna, Babinet's Principle and complementary antennas, horn antennas, rectangular horn antenna.

UNIT-4 VHF- UHF AND MICROWAVE ANTENNAS-II (9Hr)

Antenna types: Helical antenna, parabolic reflectors, Log periodic antenna, Lens Antenna, patch antennas, Antenna design considerations for satellite communication, Antennas for mobile communications systems: Mobile Terminal antennas, Base station antennas, Introduction to MIMO- Introduction to Antenna Measurements.

UNIT-5 WAVE PROPAGATION (9Hr)

Radio Wave Propagation: Introduction, ground wave propagation, free space propagation, Ground reflection, surface wave, diffraction Troposphere wave propagation Tropospheric scatter, ionosphere propagation and its parameters, electrical properties of the ionosphere, and effects of Earth's magnetic field.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	**Design** the antenna using its parameters radiation for current element.	P01, PO2, PO3
CO2	**Analyze** the structures and array patterns.	P01, P02
CO3	**Apply** fundamentals to design different types antennas.	P01, P02
CO4	**Analyze** the different antenna parameter for measuring.	P01, PO2, PO3
CO5	Have **knowledge** on different wave in different layers in different applications.	P01, P02,PO12

TEXT BOOKS:

1. John D Kraus R J Marhefka and Ahmed S Khan "ANTENNAS For all applications", Tata McGraw Hiill India, 2006, Third Edition.
2. Constantine A Balanis "ANTENNA THEORY" John Wiley & Sons, 2004, Second Edition

REFERENCE BOOKS:

1. Harish and Sachidananda: Antennas and Wave Propagation Oxford Press 2007
2. Sineon R Saunders, Antennas and Propagation for Wireless Communication Systems, John Wiley, 2003.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2
CO*	3	2.2	2	-	-	-	-	-	-	-	-	2

III Year B.Tech II Semester

L	T	P	C
2	1	0	3

18ECE323 DIGITAL SIGNAL PROCESSING

Course Educational Objectives:

1. To provide knowledge on
- Fundamentals of Signals, Systems
- Analog filters and Digital filters
- Finite word length effects
- Multi-rate signal processing

2. To develop skill to analyze frequency & complex frequency representations of signals and Systems using DFT, FFT and Z-Transform, Noise due to finite word length and processing of Multi-rate signals

3. To develop skill to design IIR filters, FIR filters, Multi-rate systems

4. To inculcate skill to investigate the effect of finite word length effect in various applications and also to develop skill to apply the concept of Multi-rate signal processing in designing of various Applications

5. To provide knowledge on the basics of DSP processors and its various architectures.

UNIT-1: DISCRETE FOURIER TRANSFORM (9Hr)

Discrete time Signals and Systems - A Review, Classification, Operation, Linear Convolution - Circular Convolution, Introduction to DFT – Properties of DFT – Computational DFT – Convolution using DFT - Fast Fourier Transform – Radix 2 DIT and DIF FFT algorithms – Inverse FFT.

UNIT- 2: IIR FILTER DESIGN (9Hr)

Analog filter approximations – Butterworth and Chebyshev – Design of IIR Digital filters from Analog filters - Impulse Invariance and Bilinear transformation - Design Examples: Analog to Digital Transformations – Illustrative Examples – Realization using Direct-Cascade and Parallel Forms

UNIT -3: FIR FILTER DESIGN (9Hr)

Characteristics of FIR Filters (Symmetric and Antisymmetric) - Linear Phase FIR filters – Frequency response – Design of FIR Filters – Frequency Sampling Method and Window Method – Design Problems – Realization using Transversal – Linear Phase.

UNIT-4:FINITE WORD LENGTH EFFECT AND MULTIRATE DIGITAL SIGNAL PROCESSING (9Hr)

Finite Word Length effect: Fixed point and Floating point Number Representations – Quantization Noise - Truncation and Rounding – Quantization noise – Coefficient quantization error – Product quantization error - Overflow error

Multirate signal processing: Decimation and Interpolation by Integer Factor - Sampling Rate Conversion by a Rational Factor – Multistage Implementation of Multirate System – Filter Implementation for Sampling Rate Conversion: Direct Form FIR Structures and Polyphase Structures

UNIT-5: INTRODUCTION TO DSP PROCESSORS (9Hr)

Introduction to programmable DSPs :Multiplier and Multiplier Accumulator (MAC) – Modified Bus Structures and Memory Access schemes in P-DSPs - Multiple access memory - multi-ported memory, VLIW Architecture, Pipelining, Special addressing modes, On-Chip Peripherals

Total Hours (45Hr).

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on fundamentals of Signals & Systems, Analyze frequency components in various signals using DFT and FFT	PO1, PO2
CO2	Identify appropriate method and design IIR filters for various specifications and realize the filter design in different structural forms	PO1, PO2, PO3, PO5
CO3	Identify appropriate method and design FIR filters for various specifications and realize the filter design in different structural forms	PO1, PO2, PO3, PO5
CO4	Demonstrate knowledge and use the concept of Finite word length effect and Multi-rate signal processing in various applications and develop filters for implementation of multi-rate signal processing	PO1,PO2,PO3,PO4 PO5
CO5	Demonstrate knowledge on fundamentals of DSP processors architectures and identify appropriate architectures for various applications.	PO1, PO2, PO4

TEXT BOOKS:

1. John G. Proakis&DimitrisG.Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. B.Venkataramani, M. Bhaskar, “Digital Signal Processors – Architecture, programming and Applications”, TATA McGraw Hill, 2nd Edition, 2010.

REFERENCE BOOKS:

1. A.V.Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, 8th Indian Reprint, Pearson, 2004.
2. Emmanuel C.Ifeachor, &Barrie.W.Jervis, “Digital Signal Processing”, Second Edition, Pearson Education / Prentice Hall, 2002.
3. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata McGraw Hill, 2007.
4. Andreas Antoniou, “Digital Signal Processing”, Tata McGraw Hill, 2006.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	3	-	2	-	-	-	-	-	-	-
CO3	2	3	3	-	2	-	-	-	-	-	-	-
CO4	2	2	2	2	2	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-
CO*	2.4	2.8	2.66	2	2	-	-	-	-	-	-	-

III Year B.Tech I semester	L	T	P	C
	2	1	0	3

18ECE324 DIGITAL DESIGN THROUGH VERILOG HDL

Course Educational Objectives:

1. The course intends to provide an overview of the principles, language constructs and programming fundamentals of Verilog HDL.
2. To design the digital systems using Gate level, Data flow and Switch level modelling styles.
3. To design the digital systems using Gate level, Data flow and Behavioural modelling styles.
4. To understand the concepts of Switch level modelling and User Defined Primitives.
5. To get the knowledge on Task, Functions, Compiler Directives and Delay models.

UNIT-1: INTRODUCTION TO VERILOG HDL (9Hr)

Overview of Verilog HDL, Hierarchical modelling concepts, Levels of Design Description, Programming Language Interface (PLI), Basic concepts, Lexical Conventions, Data types, modules and ports, Operands & Operator types.

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UNIT-2: GATE LEVEL MODELING (9Hr)

Gate Level Modelling: Gate types, Basic gates and Tri state gates, Array of instances, Design examples, Gate delays, Design of flip flops with gate primitives.

Dataflow Modelling: Introduction, Continuous Assignment, Delays, Design Examples – 4 to 1 MUX , 4 bit adder.

UNIT III: BEHAVIORAL MODELING (9Hr)

Introduction, Initial Construct, Always Construct, Procedural assignments - Blocking and Non-Blocking Assignments, Timing control, Conditional statement, Case statements, loops, sequential and parallel blocks, Procedural Continuous assignments, assign – deassign, force – release. Design examples – 4x1 multiplexer, 4 bit counter.

UNIT IV: SWITCH LEVEL MODELING (9Hr)

Basic Transistor Switches, CMOS Switches, Bi-directional Gates, Power and ground, Resistive switches, Delay specifications, Examples of switch level modelling.

User Defined Primitives: UDP basics, Combinational UDP, Sequential UDP.

UNIT V: SYSTEM TASKS, FUNCTIONS AND COMPILER DIRECTIVES (9Hr)

Differences between Tasks & Functions, Disable Statements, Named Events, Hierarchical path name, Compiler Directives.

Case Study: Design of Barrel Shifter, Floating Point Encoder, 32 bit Wallace Tree Multiplier, 32 bit Carry Look Ahead Adder.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on Basics of Verilog HDL programming, language interface, data types, operands and operators.	PO1, PO2
CO2	Design and verify the functionality of combinational logic designs using gate level and data flow modelling styles.	PO1, PO2, PO3, PO4,PO5
CO3	Design and verify the functionality of sequential logic elements using behavioural modelling styles.	PO1, PO2, PO3, PO4, PO5
CO4	Acquire the knowledge and abilities to model a digital logic using switch level and UDPs.	PO1, PO2, PO3, PO4, PO5
CO5	Gain the knowledge on Task, Functions, Compiler Directives and use them in designing digital systems using Verilog HDL.	PO1, PO2, PO3, PO4, PO5

TEXT BOOKS:

1. Verilog HDL, Samir Palnitkar, 2nd Ed., Pearson Education, 2009.
2. Design Through Verilog HDL, T.R.Padmanabhan, B.Bala Tripura Sundari , Wiley Interscience, 2009.

REFERENCE BOOKS:

1. Verilog HDL Primer, J.Bhasker, 3rd Ed., B.S.Publications, 2008.
2. Verilog Digital System Design, Zainalabdien Navabi, 2nd Edition. McGraw Hill, 2005.
3. Digital Design Principles and Practices , 3rd Ed., 2005, John F. Wakerly, PHI/ Pearson Education Asia, New Delhi.
4. Fundamentals of Logic Design with Verilog Design– Stephen. Brown and Zvonko Vranesic, TMH, 2nd Edition 2010.
5. Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA – Sunggu Lee, Cengage Learning , 2012.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	3	3	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-	-	-
CO4	3	2	2	1	3	-	-	-	-	-	-	-
CO5	3	3	3	2	3	-	-	-	-	-	-	-
CO*	3	2.4	2.5	2	3	-	-	-	-	-	-	-

III Year B Tech II Semester	L	T	P	C
	2	1	0	3

18ECE325 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Educational Objectives:

1. To demonstrate knowledge on Basic concepts of Measurement system, characteristics of instrument and different meters.
2. To Understand and analyze the different transducers
3. To illustrate and design different DC and AC bridges for measurement
4. To describe the functioning of different signal generators and analyzers
5. To Know the concepts of oscilloscope and application of special oscilloscopes

UNIT - 1: MEASUREMENT AND INSTRUMENTS (9Hr)

Measurement System-Calibration and Standards-Errors in Measurement - Static characteristics and Dynamic characteristics of instrument-Statistical analysis- Ammeter, DC Voltmeters and AC Voltmeters and its range extension, Ohmmeter, Multi meter.

UNIT - 2: TRANSDUCERS (9Hr)

Transducers- active & passive transducers: Resistance, Capacitance, inductance, Strain gauges, LVDT, Photo electric transducers-Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors.

UNIT - 3: DC AND AC BRIDGES (9Hr)

DC Bridges: Wheatstone bridge, Kelvin Bridge - AC bridges: Maxwell's bridge- Anderson Bridge- Schering Bridge - Wein Bridge –Hay's Bridge errors and precautions in using bridges.

UNIT - 4: SIGNAL GENERATORS AND ANALYZERS (9Hr)

Signal Generators- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. **Analyzers**-Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT - 5: OSCILLOSCOPES (9Hr)

Standard specifications of CRO- CRT features- vertical and horizontal amplifiers- horizontal and vertical deflection systems- sweep trigger pulse- delay line- sync selector circuits- triggered sweep CRO- and Delayed sweep- dual trace/beam CRO- Measurement of amplitude- frequency and phase (Lissajous method only). Special oscilloscopes-sampling oscilloscope- digital storage oscilloscope.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to		POs related to COs
CO1	Demonstrate knowledge on Selecting the instrument to be used based on the requirements.	PO1,PO2
CO2	Design different transducers for measurement of different parameters.	PO1,PO2,PO3
CO3	Design different bridges for measurement of different parameters.	PO1,PO2,PO3,PO4
CO4	Analyze different signal generators and analyzers.	PO1,PO2
CO5	Understand the design of oscilloscopes for different applications.	PO1,PO2,PO3

TEXT BOOKS:

1. Electronic instrumentation, H.S.Kalsi,2/e, Tata McGraw Hill,New Delhi, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques, A.D. Helfrick and W.D. Cooper, 5/e, Prentice Hall of India, New Delhi. 2002.

REFERENCES BOOKS:

1. Electronic Test Instruments (Analog & Digital Measurements) , Robert A.Witte,2/e, Pearson Education , New Delhi, 2006.
1. Measurements and Instrumentation, M.Janaki Rani& G.Sathiyabhama,Anuradha,1/e, Agancies – Chennai,2005.
2. Electronic Instrumentation & Measurements, David A. Bell, 2/e, Prentice Hall of India, New Delhi. 2003
3. A course on Electrical & Electronic Measurement and Instrumentation, A.K.Sawhney & Puneet Sawhney, 18/e, Dhanpat Rai & Co, New Delhi. 2010.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	3	3	2	2	-	-	-	-	-	-	-	-

III B.Tech II Sem	L	T	P	C
	3	1	0	3

18OSAH321 MATHEMATICAL MODELLING - ANALYSIS AND APPLICATIONS

(Common to all Branches) **(Open Elective-1)**

Course Educational Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. To learn the need and techniques of mathematical modelling, to design mathematical models through trigonometry and calculus.
3. To understand, familiarize the knowledge of the significance of ordinary differential equations of second order based mathematical models through linear.
4. To explore the practical utility of mathematical models through linear programming including transportation and assignment models.
5. To learn the concepts of linear difference equations with constant coefficients and understand some simple models through difference equations
6. To learn the concepts of Partial differential equations and its nature. To explore the knowledge on practical utility of mathematical models through mass balance equations and momentum balance equations

UNIT-I Introduction (9Hr)

The Technique of Mathematical Modelling - Classification of Mathematical Models - Some Characteristics of Mathematical Models - Mathematical Modelling Through Trigonometry, Calculus - Limitations of Mathematical Modelling

UNIT-2 Mathematical Modelling Through Ordinary Differential Equations of Second Order (9Hr)

Mathematical Modelling of Planetary Motions, Circular Motion and Motion of Satellites – Mathematical Modelling through linear differential equions of second order

UNIT-3 Mathematical Modelling Through Linear Programming (9Hr)

Mathematical Modelling through Linear Programming - Graphical Method - Simplex Method - Transportation and Assignment Models

UNIT-4 Mathematical Modelling through Difference Equations (9Hr)

The Need for Mathematical Modeling Through Difference Equations: Some Simple Models - Basic Theory of Linear Difference Equations with Constant Coefficients - Solution by Z-transformation - Mathematical Modeling Through Difference Equations in Probability Theory

UNIT-5 Mathematical Modelling Through Partial Differential Equations (9Hr)

Mass-Balance Equations: The First Method of Getting PDE Models - Momentum-Balance Equations: The Second Method of Obtaining PDE Models - Nature of Partial Differential Equations **Total : 45 hours**

Course Outcomes:

After the completion of this course, a successful student is able to

Course Outcomes		POs related to COs
CO1	Acquire knowledge in necessity and techniques of mathematical modelling, to develop analytical and designing skills in mathematical models through trigonometry and calculus.	PO1,PO2,PO3 PO4
CO2	Demonstrate knowledge in Ordinary differential equations of second order, mathematical modelling through differential equations, and Develop analytical skills in modelling geometrical problems through Ordinary differential equations of second order	PO1,PO2,PO3 PO4
CO3	Demonstrate knowledge in Linear programming and various techniques including Graphical method and Simplex method. Develop analytical and designing skills in modelling and solving Transportation and assignment models	PO1,PO2,PO3 PO4
CO4	Acquire knowledge in difference equations, theory of difference equations with constant coefficients. Develop designing and analytical skills in modelling and solving mathematical models difference equations in probability theory.	PO1,PO2,PO3 PO4
CO5	Acquire knowledge in partial differential equations and develop designing and analytical skills in modellingand solving mathematical models through Mass-Balance equations and Momentum-Balance equations	PO1,PO2,PO3 PO4

Text Books:

1. Mathematical Modelling, J.N. Kapur, New Age International (P) Limited Publishers, New Delhi

2.Advanced Engineering Mathematics, Kreysig, , John Wiley, NewYork, 1999.

Reference Books:

1.Principles of Mathematical Modelling (2004)-Clive L. Dyne, Elsevier Publication
2.Mathematical Modelling – A case study approach , R Illner, C Sean Bohun, S McCollum, T van Roode, AMS publication, 2005
1. Mathematical Modelling , D N P Murthy, N W Page, E Y Rodin, Pergamon Press,1990
2. OR Theory & Applications, J.K. Sharma , Mac Milian India Ltd., 1998
3. Mathematical Modelling(A Comprehensive Introduction), Gerhard Dangelmayr and Michael Kirby, Prentice Hall,New Jersey

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	2	-	-	-	-	-	-	-	-

III B.Tech II Sem

L	T	P/D	C
3	-	-	3

18OSAH322 BUSINESS COMMUNICATION AND CAREER SKILLS
(Open Elective-1)

Course Educational Objectives:

1. To enhance the communication skills.
2. To enable students to understand the nuances of corporate communication
3. To develop the writing skills for business purposes
4. To develop the presentation skills for corporate situations.
5. To enable students to manage interviews successfully

UNIT-I NATURE AND SCOPE OF COMMUNICATION (9Hr)

Introduction: Functions of Communication – Roles of a Manager – Communication Basics – Communication Networks – Informal Communication – Interpersonal Communication –Communication Barriers.

UNIT-2 CORPORATE COMMUNICATION (9Hr)

Introduction: What is Corporate Communication? – Corporate Citizenship and Social Responsibility – Corporate Communication Strategy – Crisis Management/Communication – Cross-Cultural Communication.

UNIT-3 WRITING BUSINESS DOCUMENTS (9Hr)

Introduction: Importance of Written Business Communication, Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing - Email writing skills – Effective Business Correspondence – Common Components of Business Letters – Strategies for Writing the Body of a Letter- Business Communication and different cultures

UNIT-4 CAREERS AND RESUMES (9Hr)

Introduction – Career Building – Business Presentations and Speeches – Resume Formats – Traditional, Electronic and Video Resumes – Sending Resumes – Follow-up Letters – Online Recruitment Process.

UNIT-5 INTERVIEWS (9Hr)

Introduction – Fundamental Principles of Interviewing – General Preparation for an Interview – Success in an Interview – Types of Interviewing Questions – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing. **Total : 45 hours**

Course Outcomes:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Explain the concept of communication, its methods and types .	PO10, PO12
CO2	Demonstrate knowledge of Corporate Communication	PO10, PO11
CO3	Apply written and oral communication techniques in preparing and presenting various documents in technical writing..	PO10,PO11, PO12
CO4	Exhibit the presentation skills in business situations	PO10,PO12
CO5	Apply verbal and nonverbal aspects in the most appropriate way in interviews	PO10, PO12

TEXT BOOK:

1. Meenakshi Raman and Prakash, Singh Business Communication, Oxford University Press, New Delhi, Second Edition, 2012.

REFERENCE BOOKS:

1. Neera Jain and Sharma Mukherji, Effective Business Communication, Tata Mc Graw-Hill Education, Pvt. Ltd., New Delhi, 2012.
2. Courtland L.Bovee et al., Business Communication Today, Pearson, New Delhi, 2011.
3. Krizan, Effective Business Communication, Cengage Learning, New Delhi, 2010.
4. R.K. Madhukar, Business Communication, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	2
CO2	-	-	-	-	-	-	-	-	-	3	2	-
CO3	-	-	-	-	-	-	-	-	-	3	2	2
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	3	-	2
CO*	-	-	-	-	-	-	-	-	-	**3**	**2**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III B.Tech II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

18OSAH323 LASERS AND FIBER OPTICS **(Open Elective-1)**

Course Educational Objectives:

1. To acquire knowledge on fundamentals of LASERS
2. To study the working of different types of LASERS
3. To develop knowledge on applications of LASERS in various fields
4. To gain knowledge in fundamentals of Optical fiber, construction, types and attenuations
5. To develop knowledge on applications of Optical fibers in various fields

Unit- 1 **(9Hr)**

LASER Introduction: Introduction- Spontaneous and stimulated emission of radiation- Properties of lasers (monochromacity, directionality, coherence and brightness) - Conditions for laser action : population inversion- Pumping and different pumping mechanisms- Einstein coefficients and relation among the coefficients.

Unit – 2 **(9Hr)**

Types of Lasers: Nd-YAG laser- He:Ne laser- Semiconductor laser(GaAs)- Argon Ion Laser-CO_2 Laser

Unit – 3 **(9Hr)**

Applications of Lasers:

Lasers in Holography- Laser in fusion reaction- Lasers in Raman spectroscopy- Lasers in industry - Lasers in isotope separation- Lasers in medicine.

Unit – 4 **(9Hr)**

Optical Fibers : Introduction- Construction of fiber – Working principle of optical fiber (total internal reflection)- Propagation of light through the fibers- Numerical aperture , Acceptance angle and Acceptance cone -Fiber types: Refractive index profile and ray propagation-Step and graded index fibers -Attenuation in fibers: Attenuation coefficient and different loss mechanisms.

Unit – 5 **(9Hr)**

Applications of fibers : Fiber optic communication system(block diagram)- Sensing applications of fibers: Pressure sensor, Liquid level sensor, Displacement sensor, Chemical sensor – Optical fibers in medicine (endoscopes) - Optical fibers in computer networks (block diagram).

On successful completion of the course the student will be able to, **Total : 45 hours**

Course Outcomes		POs related to COs
CO1	**Acquire** the basic knowledge on LASERS	PO1, PO12
CO2	**Understand** different types of LASERS	PO1, PO12
CO3	**Develop** knowledge on different applications of LASERS	PO1, PO12
CO4	**Acquire** the basic knowledge on Optical Fibers	PO1,PO12
CO5	**Develop** knowledge on different applications of Optical Fibers	PO1,PO12

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1
CO3	3	-	-	-	-	-	-	-	-	-	-	1
CO4	3	-	-	-	-	-	-	-	-	-	-	1
CO5	3	-	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

Reference Books:

1 .Lasers Theory and Applications By K.Thyagarajan and A.K.Ghatak: Macmillan India Limited, New Delhi.,

2.Lasers And non-Linear Opics, second edition,By BBLaud. NewAge International(P) limited,Publishers,New Delhi,

3. An Introduction to Fiber Optic Systems ,Second Edition,By John Powers,Richard D Irwin ,a Times Mirror Higher education,Inc Company,USA,

4. Physics for Engineers - M.R.Srinivasan , New Age International, 2009

III B.Tech II Sem

L	T	P/D	C
3	0	0	3

18OCSE321 OBJECT ORIENTED PROGRAMMING (Open Elective-1)

Course Educational Objectives:

1: To study the syntax, semantics and features of Java Programming Language.

2: To understand the principles of packages and inheritance.

3: To develop Java application programs using exceptions and interfaces.

4: To gain knowledge on multithreading and applets

5: To create GUI applications & perform event handling.

UNIT – 1 Basics of Java (9hr)

History of Java - Java Buzzwords - Overview of Java - Data Types - Variables - Arrays - Operators - Control Statements – Introducing Classes &Objects - Constructors - Methods - Access Control – this Keyword - Garbage Collection - Overloading Methods and Constructors - Parameter Passing - Recursion – Reading input-Command Line Arguments – Buffer Reader – Scanner.

UNIT – 2 String Handling, Inheritance and Packages (9hr)

String Handling-Using String Class – String Buffer Class

Inheritance-Basics of Inheritance-Using super-Creating a multilevel hierarchy-Method overriding-Dynamic method dispatch - Using abstract classes -Using final.

Packages-Defining - Creating and Accessing a Package - Understanding CLASSPATH – Importing Packages - Exploring Packages.

UNIT – 3 Interfaces and Exception Handling (8hr)

Interfaces- Differences between Classes and Interfaces - Defining an Interface - Implementing

Interface - Applying Interfaces - Variables in Interfaces and Extending Interfaces.

Exception Handling- Introduction – Exception Types – Uncaught Exception – Using Try and Catch – Multiple Catch clauses – Nested Try Statements – Throw – Throws – Finally – Built-in Exceptions – Creating Own Exception Subclass – Checked and Unchecked Exceptions.

UNIT – 4 Multithreading and Applets (10hr)

Multithreading -Differences between Multithreading and Multiprocessing - Thread Life Cycle - Creating Threads - Synchronizing Threads.

Applets- Concepts of Applet - Differences between Applet and Application - Life Cycle of an Applet

- Types of Applets - Creating Applet - Passing Parameters to Applet – Using Graphics Class.

UNIT – 5 Event Handling and AWT and Swings (9hr)

EVENT HANDLING A ND AWT - Delegation Event Model - Event Classes - Sources of Events - Event Listeners - Handling Mouse and Keyboard Events - Adapter Classes - Inner Classes - The AWT Class Hierarchy - AWT Controls : Label – Button – TextField - CheckBox - Layout Managers.

Swings - Limitations of AWT – Components - Containers - Exploring Swing - JApplet - JFrame and JComponent - JLabel and Imageicon –JTextfield - JButton - JCheck Box - JRadioButton - JCombobox - JTabbedpane - JScrollpane - JTable.

Course Outcomes: **Total : 45 hours**

On Successful completion of this course student will be able to :		**POs related to COs**
CO1	Understand the basic principles of object oriented programming	PO1,PO2, PO3, PO4,PO5,PO12
CO2	Develop Java programs with the concepts of inheritance and packages	PO1, PO2, PO3, PO4, PO5, PO12
CO3	Build Java applications using exceptions and interfaces	PO1, PO2, PO3, PO4, PO5, PO12
CO4	Use multithreading and applet concepts in developing the object oriented programming	PO1, PO2, PO3, PO5
CO5	Develop the interactive Java programs using event handling and swings	PO1, PO2, PO3, PO5

Text Books:

1. Java; The complete reference, Herbert schildt, 11th editon, TMH.
2. Beginning Java2 JDK , Ivor Horton's, 5 th Edition, WILEY Dream Tech.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, T. Budd, second edition, Pearson education.
3. Introduction to Java programming ,Y. Daniel Liang, 6 th edition, Pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, 7 th Edition, Pearson Education.

III B.Tech II Sem

L	T	P	C
3	0	0	3

18OCSE322 OPERATING SYSTEMS(open Elective-1)

Course Educational Objectives:

1: To understand main components of OS, System structures and the operations performed by OS as a resource manager.
2: To Study process concurrency and synchronization.
3: To Analyze the different memory management techniques.
4: To gain knowledge about concepts of input/ output systems and storage management
5: To manage different file systems, protection and security to the systems

UNIT – 1 : Operating Systems Overview

(10Hr)

Introduction - What Operating system do - Operating system operations - Process management - Memory management - Storage management - Protection and Security - Distributed Systems - Special purpose systems.

System structures : Operating system services - user operating system interface - System calls - Types of system calls - Operating system design and implementation - Operating system structure - Operating system generation - System boot.

UNIT - 2 : Process Management and Concurrency (8Hr)

Process Management: Process concepts – threads - scheduling-criteria – algorithms and their evaluation - Thread scheduling.

Concurrency : Process synchronization - the critical- section problem - Peterson's Solution - synchronization Hardware – semaphores - classic problems of synchronization - monitors.

UNIT – 3 : Memory Management (9 Hr)

Memory Management and Virtual Memory : Logical & physical Address Space – Swapping - Contiguous Allocation – Paging - Structure of Page Table – Segmentation - Virtual Memory - Demand Paging - Performance of Demanding Paging - Page Replacement - Page Replacement Algorithms - Allocation of Frames - Thrashing.

UNIT – 4 : Principles of deadlock AND Mass-storage structure & I/O systems (9 Hr)

Principles of deadlock - system model - deadlock characterization - deadlock prevention - detection and avoidance - recovery form deadlock.

Mass-storage structure - overview of Mass – storage structure - Disk structure - disk attachment - disk scheduling - swap-space management - RAID structure - stable-storage implementation - Tertiary storage structure.

UNIT - 5 : File system Interface **(9 Hr)**

File system Interface- the concept of a file - Access Methods - Directory structure - File system mounting - file sharing – protection - File System implementation - File system structure - file system implementation - directory implementation - allocation methods - free-space management - efficiency and performance.

Protection and Security - Goals of protection - Principles of protection - Access matrix - The security problem - program threats - System and network threats. **Total : 45 hours**

Course Outcomes:

On successful completion of this course, student will be able to:

Course Outcomes		**POs related to COs**
CO1	Analyze operating system operations ,system design and implementation	PO1, PO2
CO2	Implement Thread scheduling , solutions to synchronize problems	PO1, PO4,
CO3	Apply memory management techniques, virtual memory concepts	PO1,PO3,PO4
CO4	Manage process execution without deadlock, mass storage structure	PO1,PO4
CO5	Understand file system interface, protection and security in System and Network	PO1, PO2, PO4

Text Books:

1. Operating System Principles,8th Edition, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, 6th Edition,W. Stallings, Pearson.

References books:

1. Modern Operating Systems, 3rd Edition ,Andrew S Tanenbaum PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, 2nd Edition,A. S. Godbole, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, S, Haldar and A. A. Arvind, Pearson Education.
7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, McGraw Hill.

III B.Tech II Sem

18OCSE323	WEB PROGRAMMING(OPEN ELECTIVE-1)	L	T	P/D	C
		3	0	0	3

Course Educational Objectives:

On completion of this course, a student will be
1: familiar with client server architecture and able to develop a web application using java technologies.
2: gain the skills and project-based experience needed for entry into web application and development careers.

Unit 1: **(9 Hr)**

Introduction to HTML : HTML Common tags- Block Level and Inline Elements, Lists,Tables, Images, Forms, Frames; Cascading Style sheets, CSS Properties;
Java Script: Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script

Unit 2: **(9 Hr)**

JDBC: Data Base, Database Schema, A Brief Overview Of The JDBC Process, JDBC Driver Types, JDBC Packages, Database Connection, Associating The JDBC-ODBC Bridge With Database, Creating, Inserting, Updating And Deleting Data In Database Tables, Result Set, Metadata.

Unit 3: **(11 Hr)**

Web Servers and Servlets: Tomcat web server, Introduction to Servlets: Servlets, the Advantage of Servlets over "Traditional" CGI, Basic Servlet Structure, Simple Servlet Generating Plain Text, Compiling and Installing the Servlet, Invoking the Servlet, Lifecycle of a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Context Parameters, Handling Http Request & Responses, Using Cookies-Session Tracking, Servlet with JDBC.

Unit 4: **(8 Hr)**

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods , Sharing Data Between JSP pages, Users Passing Control and Data between Pages, JSP application design with JDBC, JSP Application Design with MVC.

Unit 5: **(8 Hr)**

Introduction to PHP: Basics of PHP, Functions, Error Handling, Interaction between PHP and MySQL, Database using Forms,Using PHP to manipulate and Retrieve Data in MySQL.

Total : 45 hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to Cos
CO1	Write a well formed / valid XML document.	PO1, PO2, PO3, PO5
CO2	Connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.	PO1, PO2, PO3, PO5
CO3	Develop a dynamic webpage by the use of java script and DHTML.	PO1, PO2, PO3
CO4	Write a server side java application called Servlet to catch form data sent from client, process it and store it on database.	PO1, PO2, PO3, PO5
CO5	Write a server side java application called JSP to catch form data sent from client and store it on database	PO1, PO2, PO3, PO5

TEXT BOOKS:

1. Jon Duckett "Beginning Web Programming with HTML, XHTML, and CSS (Wrox Programmer to Programmer)
2. Marty Hall and Larry Brown "Core Servlets and Java Server pages Vol. 1: Core Technologies", Pearson.

REFERENCE BOOKS:

1. DanWoods and GautamGuliani,"Open Source for the Enterprise: Managing Risks, Reaping Rewards", O'Reilly, Shroff Publishers and Distributors, 2005.
2. Sebesta,"Programming world wide web" Pearson.
3. Dietel and Nieto,"Internet and World Wide Web – How to program",PHI/Pearson Education Asia.
4. Murach,"Murach's beginning JAVA JDK 5", SPD
5. Wang,"An Introduction to web Design and Programming",Thomson

III B.Tech II Semester

L	T	P	C
2	1	0	3

18OCIV321 CONSTRUCTION AND PROJECT MANAGEMENT(Open Elective-1)

Course Educational Objectives:

1. To study the fundamentals of construction technology
2. To study the earth work methods
3. To study the concepts of project management and milestones
4. To study the concept of elements of network and development of network
5. Tostudy the concept of network analysis

UNIT I: FUNDAMENTALS OF CONSTRUCTION TECHNOLOGY (9 Hr)

Definitions and Discussion – Construction Activities – Construction Processes - Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Construction Documents – Construction Records – Quality – Safety – Codes and Regulations

UNIT II: EARTHWORK (9 Hr)

Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging**.**

Excavation By Blasting: Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drillability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting.

UNIT III: PROJECT MANAGEMENT AND BAR CHARTS AND MILESTONE CHARTS (9 Hr)

Introduction – Project planning – Scheduling – Controlling – Role of decision in project management – Techniques for analyzing alternatives Operation research – Methods of planning and programming problems Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts – Development of PERT network problems.

UNIT IV: ELEMENTS OF NETWORK AND DEVELOPMENT OF NETWORK:

Introduction – Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles Problems – Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure –Hierarchies – Illustrative examples – Problems.

(9 Hr)

UNIT V: NETWORK ANALYSIS (9 Hr)

CPM : process – CPM : Networks – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for TE and TL - Start and finish times of activity – Float – Critical activities and critical path – Illustrative examples Problems.

Total : 45 hours

Course Outcomes:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Apply theoretical and practical aspects of project management techniques to achieve project goals.	PO1,PO3
CO2	Exhibit organizational and leadership capabilities for effective management of construction projects.	PO2,PO3
CO3	Apply knowledge and skills of modern construction practices and techniques.	PO2,PO5, P11
CO4	Demonstrate the basic of project management	PO2 PO4
CO5	Develop the network for construction projects and examine the critical path	PO2,PO3

Text Books:

1. Construction Technology by SubirK.Sarkar and SubhajitSaraswati – Oxford Higher Education- Univ.Press, Delhi.
2. Project Planning and Control with PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi.
3. Construction project management by Jha, Pearson pubilications, New Delhi

Reference Books:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.
2. Total Project management, the Indian context- by: P.K.Joy- Mac Millan Publishers India Limited.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	3	-		-	-	-	-	-	-	-
CO2	-	2	3	-		-	-	-	-	-	-	-
CO3	-	2	-	-	2	-	-	-	-	-	1	-
CO4	-	2	-	2		-	-	-	-	-	-	-
CO5	-	2	2			-	-	-	-	-	-	-
CO*	**1**	**2**	**2.6**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OCIV322 REMOTE SENSING AND GIS(Open Elective-1)

Course Educational Objectives:

1. To know the basics, importance, analysis and applications of RS and GIS
2. To study the various types of operating systems of RS and GIS
3. To know the applications of RS and GIS

UNIT 1: INTRODUCTION TO REMOTE SENSING (10 Hr)

Concept and scope of remote sensing: Definitions, Process and Characteristics of Remote Sensing System, Advantages and limitations.

Concept of electromagnetic radiation (EMR): Wavelength-frequency-energy relationship of EMR, EMR Spectrum and its properties, EMR wavelength regions and their applications, Spectral signatures.

Energy interaction in the atmosphere and with earth surface features: Scattering, absorption, transmission, atmospheric windows Spectral Reflectance Curve, Concept of signatures.

UNIT 2: PLATFORMS AND SENSORS (12 Hr)

Introduction: Sensor materials, Sensor System - Framing and Scanning System, Whiskbroom scanners, Push-broom scanners.

Types and characteristics of sensor: Imaging and non-imaging sensors, Active and passive sensors, Resolution of Sensors - Spectral, Spatial, Radiometric & Temporal, Scale, Mapping unit, Multi-band concepts and False Colour Composites.

Remote sensor platforms and satellite orbits: Ground, Airborne and Space borne Platforms, Orbital Characteristics – Coverage, Passes, Pointing Accuracy, Geostationary, Sun synchronous, shuttle orbit.

Space imaging satellites: Early history of space imaging; Multispectral and Hyperspectral sensors, Radar, Lidar; Specification of some popular satellites – IRS, Landsat and SPOT series; High resolution satellites – IKONOS, Cartosat, Quick bird, Orb View, Geo Eye, Pléiades, World View; Other latest earth resource satellites.

UNIT 3: REMOTE SENSING APPLICATIONS (9 Hr)

Scope of Remote Sensing Applications - Potentials and Limitations. Applications in land use and land cover analysis. Resource evaluation - Soils, forest and agriculture.Water Resource

Applications- Mapping, monitoring of surface water bodies, tanks, lakes/reservoirs.Environmental applications.

UNIT 4: GEOGRAPHIC INFORMATION SYSTEM (7 Hr)

Basic Concepts: Definition of GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS, Areas of GIS application, Advantage and Limitation of GIS

UNIT 5: GIS DATA (7 Hr)

Spatial and Attribute Data, Information Organization and Data Structures – Raster and Vector data structures, Data file and database

Creating GIS Database: GIS Software's, file organization and formats, Geo-database, Database model, Rectification, Digitization and Map Composition

Total : 45 hours

Course Outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Explain the principles and applications of Remote Sensing and various types of platforms used in Remote Sensing.	PO1, PO2, PO3,
CO2	Understand the principles of remote sensing and digital image processing;	PO1
CO3	Understand the principles of geographic information systems (GIS)	PO1, PO2, PO4,
CO4	Demonstrate the applications of remote sensing and GIS to solving problems in the environmental and life sciences;	PO1, PO3
CO5	Demonstrate the use of image processing and GIS software	PO3

Text Books:

1. Text Book of Remote Sensing and Geographic Information System, M. Anji Reddy, BS Publication.
2. Concepts and Techniques of GIS, Lo C.P. &Yeung A.K.W., Prentice-Hall of India, New Delhi, 2004

Reference Books:

1. Remote sensing and Geographic Information System, B.Bhatta, Oxford Publications.
2. Introduction to Geographical Information System, Siddiqui, M.A., ShardaPustak , Bhavan, Allahabad, 2006
3. Principles of Remote Sensing, Curran, Paul J, Longman, London, 1985.
4. Data User Handbook, NRSA, IRS, Hyderabad

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2									
CO2	3											
CO3	1	2		2								
CO4	1		2									
CO5			2									
CO*	**1.5**	**2**	**2**	**2**								

III B.Tech II Semester **L T P C**

3 0 0 3

18OCIV323 GREEN BUILDINGS AND ENERGY CONSERVATION(Open Elective-1)

Course Educational Objectives:

1. To introduces green building concepts.
2. To explain the design process of green buildings
3. To teach the thermal flow in buildings
4. To demonstrate the materials required .for green house construction
5. To analyze the costs involved in green buildings

UNIT 1: GREEN BUILDING CONCEPTS (9 Hr)

Orientation – Introduction to bioclimatic architecture, sustainability in building science functional planning – Elements of building design and drawing, regulations and bylaws –Traditional Vs vernacular architecture – Climate zones, design charts, sun path diagram, solar angles, indices of thermal comfort, vernacular buildings in different climate zones.

UNIT 2: CLIMATE RESPONSIVE SCIENTIFIC PROCESS OF DESIGN(9)

Introduction, various steps, site planning , plan form building envelope landform, topography, vegetation, water bodies; orientation, S/V ratio, P/A ratio, walls, fenestration, roof and floors active Vs passive, passive solar architecture.

UNIT 3: THERMAL FLOW IN BUILDINGS (9 Hr)

Calculation of thermal conductance, heat flow through different building elements; various software ventilation and day lighting – Design and placement of openings – Water management in buildings techniques to recycle, reuse and harvest water.

UNIT 4: GREEN BUILDING MATERIALS AND CONSTRUCTION (9 Hr)

Material properties, energy efficiency using various materials, emerging new materials construction techniques – Techniques for roof, wall and foundations.

UNIT 5: ECONOMY OF GREEN BUILDING (9 Hr)

Cost of building, operation and maintenance – Green building rating system, evaluation criteria of LEED, TERI GRIHA case studies, case studies in different climate zones.

Total : 45 hours

Course outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Explain the green building concepts	PO1
CO2	explain the design process of green buildings	PO1
CO3	Demonstrate the thermal flow in buildings	PO1, PO2
CO4	Demonstrate the materials required .for green house construction	PO1,
CO5	Identify the costs involved in green buildings	PO1

Text books:

1. Climate Responsive Architecture, A Design Handbook For Energy Efficient Buildings, Krishnan, A., Baker, N., Yannas, S., and Szokolay, S., Eds., 2001, Tata McGraw–HillPublishing Company, New Delhi.
2. Sustainable building design manual (Vol.II), TERI & ICAEN (InstitutCataladEnergia), 2004, The Energy and Resources Institute (TERI) Press, New Delhi.

Reference Books:

1. Bureau of Indian Standards, SP:41, Handbook on Functional Requirements of Buildings (Other Than Industrial Buildings) 1/e rp,1995, Bureau of Indian Standards, New Delhi.
2. Indian Green Building Council, LEED-India, 2011, LEED 2011 for India- Green building Rating system, abridged reference guide for new construction and major renovations (LEED India NC). Hyderabad: Indian Green Building Council.
3. Manual of Tropical Housing and Building, Koenigsberger, O., ingersoll, T. G., Mayhew, A., &Skozolay, S. V., 2011, Universities Press, Hyderabad.
4. Building Design and Drawing, Prabhu, Balagopal T S, K Vincent Paul, and C Vijayan, 2008, Calicut:Spades Publishers.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3	2										
CO4	3											
CO5	3											
CO*	**3**	**2**										

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.TECH III-II SEM

L	T	P	C
3	0	0	3

18OEEE321 **SCADA SYSTEM AND APPLICATIONS**

(Open Elective-1)

Course Educational Objectives:

On successful completion of the course, students will be able to

1: To understand the fundamentals of SCADA.
2: To analyze the SCADA Components, Communication, Monitoring and Control
3: To analyze the application of SCADA in power System
4: Understand the Energy efficient motors and power factor improvement.
5: Know the concept Energy Measuring Instruments.

Unit 1: Introduction to SCADA **9 hours**

Evolution of SCADA, SCADA definitions, SCADA Functional requirements and Components, SCADA Hierarchical concept, SCADA architecture, General features, SCADA Applications, Benefits

Unit 2: SCADA System Components **9 hours**

Remote Terminal Unit (RTU), Interface units, Human- Machine Interface Units (HMI), Display Monitors/Data Logger Systems, Intelligent Electronic Devices (IED), Communication Network, SCADA Server, SCADA Control systems and Control panels.

Unit 3: SCADA Communication **10 hours**

SCADA Communication requirements, Communication protocols: Past, Present and Future, Structure of a SCADA Communications Protocol, Comparison of various communication protocols, IEC61850 based communication architecture, Communication media like Fiber optic, PLCC etc. Interface provisions and communication extensions, synchronization with NCC, DCC.

Unit 4: SCADA Monitoring and Control **8 hours**

Online monitoring the event and alarm system, trends and reports, Blocking list, Event disturbance recording. Control function: Station control, bay control, breaker control and disconnector control.

Unit5: SCADA Applications in Power System **9 hours**

Applications in Generation, Transmission and Distribution sector, Substation SCADA system Functional description, System specification, System selection such as Substation configuration, IEC61850 ring configuration, SAS cubicle concepts, gateway interoperability list, signal naming concept. System Installation, Testing and Commissioning.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Explain the fundamentals of SCADA.	PO1, PO2.
CO2	Describe the system components of SCADA	PO1,PO2
CO3	Elucidate the SCADA communication	PO1,PO2
CO4	Acquire knowledge on the monitoring and control of SCADA	PO1,PO2
CO5	Describe the applications of SCADA in power system.	PO1,PO2

Text Books:

1. Stuart A. Boyer: SCADA-Supervisory Control and Data Acquisition, Instrument Society of America Publications, USA.

References:

1. Gordon Clarke, Deon Reynders: Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems, Newness Publications, Oxford, UK, 2004.
2. William T. Shaw, Cybersecurity for SCADA systems, PennWell Books, 2006

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**2.8**	**2.6**										

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III. B.TECH .II SEM

L	T	P	C
3	0	0	3

18OEEE322 **SERVICING OF ELECTRICAL APPLIANCES**

(Open Elective-1)

Course Educational Objectives:

On successful completion of the course, students will be able to

1: To learn the servicing of various Electrical appliances.
2: To understand the importance of Earthing for safe operation
3: To Know the concept of different electrical appliances
4: To understand the concept of Protection devices
5: To know the concept of Electrical Safety

Unit-1 Introduction: **9 hours**

Introduction to electrical appliances-Importance of electrical wiring – Principle of domestic wiring- Wiring system using casing & capping, PVC, and concealed system- wiring connections: tube light wiring, staircase wiring, house wiring.

Unit-2 Testing and Fault Identification of low power appliances: **9 hours**

Maintenance and repair of domestic equipments - electric iron box- - ceiling fan - electric kettle, Heater/immersion heater-washing machine- grinder-mixer

Unit -3 Servicing of high power Appliances: **9 hours**

Testing of different electrical appliances-geyser-hot plates-pumps– induction stove- refrigerator etc.

Unit -4 Protection Devices and Testing Equipments: **9 hours**

Study of fuses- Contactors-Circuit Breakers- Relays - Measurement of voltage, current and resistance using multi meter and Clamp meter - Usage of continuity tester- line tester - test lamp.

Unit 5 Practice on Earthing and Electrical safety: **9 hours**

Basic principles of earthing-different methods of earthing-importance of earthing- fundamental of safe installation of equipments – precautions & prevention of electrical shock- Types of Shocks - first Aid.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the fundamental concepts of Electrical appliances.	PO1,PO2,PO3,PO12
CO2	Apply the concept to trace and identify the fault in low power appliances.	PO1,PO2,PO3,PO12
CO3	Apply the concept to trace and identify the fault in power appliances	PO1,PO2,PO3,PO12
CO4	Illustrate the concept of protective devices and measuring instruments.	PO1,PO2,PO3,PO12
CO5	Understand the importance of earthing for safe operations and Analyze any electrical connection and rectify the fault	PO1,PO2,PO3,PO12

Text Books:

1. Troubleshooting and Repairing Commercial Electrical Equipment by David Herres, Mc Graw Hill Publications, 2013
2. Elements of Induction Heating design and control application by S. Zinn, S. L. Semiatin, ASM international publications.

Reference Books:

1. Elstan A. Fernandez, Marine Electrical technology.
2. Electrical Safety, Fire Safety Engineering and Safety Management by S. Rao, R.K. Jain, H.L. Saluja

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2
CO4	3	2	2	-	-	-	-	-	-	-	-	2
CO5	3	2	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**2**	**2**									**2**

III. B.TECH .II SEM

L	T	P	C
3	0	0	3

18OEEE323 POWER SYSTEM REFORMS(Open Elective-1)

Course Educational Objectives:

On successful completion of the course, students will be able

1: To study fundamentals of power system deregulation and restructuring.
2: To study available transfer capability.
3: To study congestion management
4: To study various electricity pricing methods.
5: To study operation of power system in deregulated environment.

Unit–I: Over view of key issues in electric utilities **9 hours**

Introduction – Restructuring models – Independent system operator (ISO) – Power Exchange– Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion.

Unit–II: Available Transfer Capability (ATC) **9 hours**

Structure of OASIS – Processing of Information – Transfer capability on OASIS –Definitions Transfer Capability Issues – ATC – TTC – TRM – CBM calculations –Methodologies to calculate ATC.

Unit–III: Congestion Management **9 hours**

Introduction to congestion management – Methods to relieve congestion

Unit–IV: Electricity Pricing **9 hours**

Introduction – Electricity price volatility electricity price indexes – Challenges to electricity pricing – Construction of forward price curves – Short–time price forecasting.

Unit–V: Power system operation in competitive environment **9 hours**

Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a GENCO.

TOTAL: 45 Hours

Course outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Will understand importance of power system deregulation and restructuring.	PO1,PO2,PO3
CO2	Able to compute Available Transfer Capability**.**	PO1,PO2,PO3,
CO3	Will understand transmission congestion management.	PO1,PO2, PO3
CO4	Able to compute electricity pricing in deregulated environment.	PO1,PO2,PO3
CO5	Will be able to understand power system operation in deregulated environment.	PO1,PO2,PO3

Text Books:

1. Kankar Bhattacharya, Math H.J. Boller, JaapE.Daalder, 'Operation of Restructured Power System' Kluver Academic Publisher – 2001.
2. Mohammad Shahidehpour, and Muwaffaqalomoush, – "Restructured electrical Power systems" Marcel Dekker, Inc. 2001

Reference Books:

1. Loi Lei Lai; "Power system Restructuring and Deregulation", Jhon Wiley & Sons Ltd., England.
2. Electrical Power Distribution Case studies from Distribution reform, upgrades and Management (DRUM) Program, by USAID/India, TMH

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**									

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OMEC321 INDUSTRIAL ROBOTICS(Open Elective-1)

Course Educational Objectives:

1. To know the robot drive systems and internal grippers and external grippers
2. To understand the image processing and analysis of image data
3. To learn Robot motion analysis and control.
4. To study the robot language structure and programming
5. To explain the various applications of robots in industry

UNIT – 1: FUNDAMENTALS OF ROBOTIC TECHNOLOGY AND DRIVE SYSTEM (9Hr)

Introduction – Robot anatomy – Robot configuration and motions – Robot specifications – Pitch, yaw, roll, joint notations, speed of motion, pay load – Work volume. **Robot Drive System:** Pneumatic, hydraulic drives, mechanical and electrical drives – Servo motors and stepper motor. **Grippers:** Mechanical, pneumatic and hydraulic grippers, magnetic grippers and vacuum grippers – Two fingered and three fingered grippers – Internal and external grippers.

UNIT – 2: ROBOT SENSORS AND MACHINE VISION (9 Hr)

Robot Sensors: Position of sensors – Range sensors – Proximity sensors – Touch sensors – Wrist sensors – Compliance sensors – Slip sensors. **Machine Vision**: Camera – Frame grabber – Sensing and digitizing image data – Signal conversion – Image storage and lighting techniques – Image processing and analysis – Data reduction – Edge detection – Segmentation feature extraction – Object recognition.

UNIT – 3: ROBOT MOTION ANALYSIS AND CONTROL (11 Hr)

Robot Kinematics: Manipulator kinematics – Position representation – Forward and reverse transformation – Adding orientation – Homogeneous transformations – D-H notation – Forward and inverse kinematics. **Robot Dynamics:** Differential transformation – Compensating for gravity – Robot arm dynamics. **Trajectory Planning:** Trajectory planning and avoidance of obstacles – Path planning – Skew motion – Joint integrated motion – Straight line motion.

UNIT – 4: ROBOT PROGRAMMING (9 Hr)

Robot Programming: Lead through programming – Robot language structure – Motion commands of move, speed control, workplace, path, frames, end effecter operation, sensor operation and react statement – Program sequence and subroutine – Teach pendant programming – VAL II programming.

UNIT – 5: ROBOT APPLICATIONS AND IMPLEMENTATION PRINCIPLES (7 Hr)

Robot Applications: Material transfer and machine loading / unloading – Processing applications in spray coating – Assembly and inspection automation – Future applications of robot in mines, under water and space. **Implementation Principles:** Selection of robots in industry applications – Economic analysis of the robot.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the robot drive systems and internal grippers and external grippers.	**PO1**
CO2	Recognize the image data and analysis the image processing	**PO1, PO12**
CO3	Understand the basic concepts of robot motion and analysis	**PO1,PO2,PO3**
CO4	Know the robot language structure and robot programming.	**PO1,PO2, PO3, PO12**
CO5	Explain the applications of robots in industries and Safety considerations in workplace	**PO1,PO11, PO12**

Text Books:

1. Industrial Robotics: Technology, Programming and Applications, Mikell P Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G Odrey and Ashish Dutta 2/e, 2012, Tata McGraw-Hill Education Pvt. Ltd.,
2. Robotics: Control, Sensing, Vision and Intelligence, K.S. Fu, R.C.Gonzales and C.S.G.Lee, 1/e, 2008, Tata McGraw-Hill Education Pvt. Ltd., Noida.

References:

1. Introduction to Robotics: Analysis, Control, Applications, 3/e, 2020, Saeed B.Niku, Wiley India Pvt, Ltd., New Delhi.
2. Robotics Technology and Flexible Automation, S.R.Deb and Sankha Deb, 2/e, 2010, Tata McGraw-Hill Education Pvt. Ltd., Noida.
3. Robots and Robotics - Principles, Systems, and Industrial Applications, Mark R Miller & Rex Miller 2017, McGraw-Hill Education.
4. Introduction to Robotics: Mechanics and Control, John J. Craig, 3/e, 2008, Pearson Education, New Delhi.
5. Robotics: Fundamental Concepts and Analysis, Ashitava Ghosal, 1/e, 2006, Oxford University Press, New Delhi.
6. Robotics and Industrial Automation, Rajput R.K, 2008, S.Chand Publications, New Delhi.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	3	-	-	-	-	-	-	-	-	-	-	1
CO.3	3	2	1	-	-	-	-	-	-	-	-	-
CO.4	3	2	1	-	-	-	-	-	-	-	-	1
CO.5	3	-	-	-	-	-	-	-	-	-	1	1
CO*	**3**	2	1	-	-	-	-	-	-	-	1	1

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OMEC322 POWER PLANT TECHNOLOGY (Open Elective-1)

Course Educational Objectives:

1. To understand the working principles of steam power plants and analyzes its performance.
2. To know the working principles of diesel and gas turbine power plant
3. To clarify the working of nuclear power plant and safety measures
4. To recognize the sources of renewable energies and hydroelectric power generation techniques.
5. To learn the economics, Energy management and environmental issues of power generation.

UNIT – 1: STEAM POWER PLANT (9 Hr)

Rankine cycle – Layout of modern coal power plant – Super critical boilers, FBC Boilers, turbines, condensers, steam and heat rate – Subsystems of thermal power plants – Fuel and ash handling – Draught system – Feed water treatment – Binary cycles and cogeneration systems.

UNIT – 2: DIESEL AND GAS TURBINE POWER PLANT (9 Hr)

Diesel Power Plant: Introduction – IC Engines, types, construction – Plant layout with auxiliaries – Fuel supply system, air starting equipment, lubrication and cooling system – Super charging. **Gas Turbine Power Plant**: Introduction – Classification – Construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines – Combined cycle power plants and comparison.

UNIT – 3: NUCLEAR POWER PLANT (9 Hr)

Basics of nuclear engineering– Fuels and nuclear reactions – Layout and subsystems – Reflectors – Pressurized water reactor (PWR) – Boiling water reactor (BWR) – CANada Deuterium- Uranium reactor (CANDU) – Gas cooled and liquid metal fast breeder reactor – Heavy water reactor – Working and comparison – Safety measures for nuclear power plants.

UNIT – 4: HYDROELECTRIC POWER PLANT AND RENEWABLE ENERGY SOURCE (9 Hr)

Hydroelectric Power Plant: Water power – Hydrological cycle – Hydrographs – Storage and pondage – Classification of dams and spill ways – Hydroelectric typical plant layout and components – Pumped storage power plants – Selection of turbines. **Renewable Energy Sources:** Principle, construction and working of wind, tidal, solar photo voltaic, solar thermal, geo thermal, biogas and fuel cell systems.

UNIT – 5: ENERGY MANAGEMENT, ECONOMICS AND ENVIRONMENTAL ISSUES (9 Hr)

Energy Management: Power tariff types – Load distribution parameters – load curve – Comparison of site selection criteria, relative merits and demerits – Capital and operating cost of different power plants. **Environmental Issues:** Effluents from power plants – Impact on environment – Pollutants – Pollution standards – Methods of Pollution control – Control of waste disposal and recovery – Waste disposal options for coal and nuclear power plants.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the working principles of steam power plants and analyze performance	**PO1,PO2,PO3, PO6, PO7, PO12**
CO2	Understand the working principles of diesel and gas turbine power plant	**PO1,PO3, PO6, PO7,PO12**
CO3	Explain the working of nuclear power plant with safety measures	**PO1,PO2,PO3, PO6, PO7, PO12**
CO4	Explain the working power generation technologies from various renewable energy sources and hydroelectric power generation system	**PO1,PO2,PO3, PO6, PO7, PO12**
CO5	Describe environmental issues of power generation.	**PO1,PO2,PO3, PO6, PO7, PO12**

Text books:

4. Power Plant Engineering, P.K.Nag, 4/e, 2014, McGraw-Hill Education Pvt. Ltd., New Delhi.
5. Power Plant Engineering, R.K Hegde, 1/e, 2015, Pearson Education, India.

Reference books:

1. Power Plant Technology, M. M. El-Wakil, 1/e, 2010, Tata McGraw-Hill, New Delhi.
2. A Course in Power Plant Engineering, Arora and S. Domkundwar, 6/e, 2012, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Introduction to Power Plant Technology, G.D.Rai, 3/e, 2012, Khanna Publishers, New Delhi.
4. Power Plant Engineering, G.R. Nagpal and S.C. Sharma, 16/e, 2004, Khanna Publisher, New Delhi.
5. A Text Book of Power Plant Engineering, R.K.Rajput, 5/e, 2016, Laxmi Publications (P) Ltd., New Delhi.
6. Power Generation Handbook, Philip Kiameh, 2/e, 2013, Tata McGraw-Hill, New Delhi.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	-	-	1	1	-	-	-	-	1
CO.2	3	-	2	-	-	1	1	-	-	-	-	1
CO.3	3	2	1	-	-	1	1	-	-	-	-	1
CO.4	3	2	1	-	-	1	1	-	-	-	-	1
CO.5	3	2	1	-	-	1	3	-	-	-	-	2
CO*	**3**	**2**	**1.4**	-	-	**1**	**1.2**	-	-	-	-	**1.5**

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OMEC323 MECHATRONICS SYSTEM(Open Elective-1)

Course Educational Objectives:

1. To recognize the fundamentals of Mechatronics, Control Systems, Transducers and Sensors
2. To understand the functions of Mechanical, Electrical, Hydraulic, and Pneumatic Actuators.
3. To express the Basic system models and Controllers used in Mechatronic systems
4. To realize the applications of microprocessors and Programmable Peripheral Interface
5. To recognize the Elements of programmable logic controller in mechatronic system

UNIT – 1: MECHATRONICS, SENSORS AND TRANSDUCERS (9 Hr)

Introduction: Integrated design issues in mechatronics – Mechatronics key elements – Applications in mechatronics – Introduction to mechatronics systems and measurement systems. **Control Systems:** Open loop, closed loop, automatic control, block diagram, pneumatic control and hydraulic control systems. **Transducers:** Actuating mechanisms – Electro-mechanical, resistance, variable inductance, capacitive, piezoelectric, photoelectric, thermo electric and Hall Effect transducers – Strain gauge. **Sensors:** Proximity, pneumatic, light, tactile and smart sensors – Load cells – Digital encoders – Selection of sensors.

UNIT – 2: ACTUATIORS (9 Hr)

Mechanical Actuator: Gear drive, belt drive, chain drive and bearings. **Electrical Actuator:** Mechanical and solid state switches – Construction and working principle of stepper motor and servo motor. **Hydraulic Actuators:** Hydraulic systems – Pumps, regulator, compressors and valves – Linear and rotary actuator. **Pneumatic Actuators:** Pneumatic systems – Valves – Linear and rotary actuator.

UNIT – 3: SYSTEM MODELS AND CONTROLLERS (9 Hr)

System Models: Basic system models – Mechanical system buildings – Electrical system buildings – Fluid system buildings – Thermal system buildings – Rotational-translational systems – Electro mechanical systems – Hydraulic mechanical systems. **Controller:** Control, two step, proportional and derivative mode – Combination of PD, PI and PID – PID and igital controllers – Concepts in adaptive control systems.

UNIT – 4: MICROPROCESSORS AND PROGRAMMABLE PERIPHERAL INTERFACE (9 Hr)

Microprocessors: Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontroller with block diagram. **Programmable Peripheral Interface:** Architecture of 8255 – Keyboard interfacing – LED display – Interfacing – ADC and DAC interface – Temperature control – Stepper motor control – Traffic control interface.

UNIT– 5: PROGRAMMABLE LOGIC CONTROLLER & MECHATRONIC SYSTEMS (9 Hr)

Programmable Logic Controller: Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC. **Mechatronic Systems:** Design process of engine management system, automatic camera, automatic washing machine, pick and place robot, automatic car park barrier, wireless surveillance balloon, uninterruptible power supply, coin counter and electrically controlled robotic arm.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the fundamentals of Mechatronics, Control Systems, Transducers and Sensors	**PO1, PO2**
CO2	Illustrate the functions of Mechanical, Electrical, Hydraulic, Pneumatic Actuators in mechatronics systems	**PO1, PO2, PO3**
CO3	demonstrate the Basic system models and Controller used in Mechatronic systems	**PO1, PO2**
CO4	Understand the applications of microprocessors and and Programmable Peripheral Interface	**PO1, PO2**
CO5	Know the Elements of programmable logic controller in mechatronic system	**PO1, PO2, PO3**

Text Books:

1. Mechatronics: Electronic control systems in mechanical and electrical engineering, William Bolton, 6/e, 2019, Pearson Education, India.
2. A Textbook of Mechatronics, R.K.Rajput, 4/e, 2007, S. Chand & Co.

Reference Books:

1. Mechatronics Systems Design, Devdas Shetty and Richard A. Kolk, 2/e, 2011, Cengage Learning.
2. Mechatronics, Principles and Applications, Godfrey Onwubolu, 1/e, 2005, Elsevier Butterworth-Heinemann.
3. Introduction to Mechatronics and Measurement Systems, David G. Alciatore and Michael B. Histand, 4/e, 2014, Tata McGraw Hill Education.
4. Mechatronics: A Foundation Course, Clarence W. de Silva, 1/e, 2010, CRC Press, Taylor & Francis Group
5. Mechatronics with Experiments, Sabri Cetinkunt, 2/e, 2015, John Wiley & Sons Ltd
6. Mechatronics : Principles, Concepts and Applications, Nitaigour Premchand Mahalik, 1/e, 2003, Tata McGraw Hill Education.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	3	2	1	-	-	-	-	-	-	-	-	-
CO.3	3	2	-	-	-	-	-	-	-	-	-	-
CO.4	3	2	-	-	-	-	-	-	-	-	-	-
CO.5	3	2	1	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**1**	-	-	-	-	-	-	-	-	-

III Year B.Tech II semester	L	T	P	C
	0	0	2	1

18ECE 326 ANALOG & DIGITAL COMMUNICATIONS LAB

Course Educational Objectives:

CEO1: To understand the functionality of CRO & DSO display devices.

CEO2: To provides the practical knowledge of Analog modulation techniques with input-output Waveforms.

CEO3: To develop skills on working of multiplexing (analog & digital) system in communication Practically.

CEO4: To provides the practical knowledge on pulse analog modulation systems.

CEO5: To know the practical knowledge of Digital modulation techniques with input-output Waveforms.

LIST OF EXPERIMENTS:

PART-A: ANALOG COMMUNICATIONS

Minimum five experiments to be conducted:

1. Introduction to Digital Storage Oscilloscope (DSO)
2. AM generation and demodulation.
3. FM generation and demodulation
4. Pre-emphasis and de-emphasis
5. Balanced Modulator & Synchronous Detector.
6. SSB Generation and Detection
7. Frequency Division Multiplexing & Demultiplexing

PART-B: DIGITAL COMMUNICATIONS

Minimum seven experiments to be conducted:

1. Time Division Multiplexing & Demultiplexing
2. Pulse Amplitude Modulation & Demodulation
3. Pulse Position Modulation & Demodulation.
4. ASK Modulator and Demodulator.
5. FSK Modulator and Demodulator.
6. PSK Modulator and Demodulator.
7. DPSK Modulator and Demodulator.
8. QPSK Modulator and Demodulator.

COURSE OUTCOMES:

On successful completion of course the students will be able to		POs related to COs
CO1	Demonstrate knowledge on study of DSO, and analog and Digital communication systems	PO1
CO2	Analyze the functionality of generation and degeneration of modulation techniques	PO2
CO3	Design the circuits which are used to improve the SNR in FM systems	PO3
CO4	Conduct investigation and test the functionality on implementation of generation and degeneration circuits.	PO4
CO5	Select appropriate trainer Kit and procedure to analyze and implement analog and Digital modulation systems	PO5
CO6	Follow ethical principles in analyzing and implementing various base band and band pass modulation techniques	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to communication for various applications during their life time.	PO12

EQUIPMENTS REQUIRED FOR LABORATORY:

1. Digital Storage Oscilloscope: 0-50MHz.
2. Regulated Power Supply : 0-30V
3. Cathode Ray Oscilloscope: 0-20MHz
4. Function Generator: 0-1MHz
5. Lab Equipmental/ Trainer Kits for Analog and Digital Communication
6. Multimeters and Components.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO6	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**
CO7	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**
CO8	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**3**	**-**	**-**
CO9	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

III Year B.Tech. II semester	L	T	P	C
	0	0	2	1

18ECE327 DIGITAL DESIGN THROUGH VERILOG HDL LAB

Course Educational Objectives:

1. Gain the practical hands-on experience on verilog HDL programming
2. To design, simulate and verify the combinational logic designs using verilog HDL.
3. To design, simulate and verify the sequential logic designs using verilog HDL.
4. To implement combinational designs on target FPGA Hardware.
5. To implement sequential designs on target FPGA Hardware.

LIST OF EXPERIMENTS

Minimum 10 experiments to be conducted:

Design of Combinational Circuits:

1. Design and simulation of basic gates and universal gates: NOT, AND, OR, NAND, NOR, XOR and XNOR using data flow modelling.
2. Design and simulation of Half Adder and 1 - bit Full Adder using data flow and structural modelling.
3. Design and simulation of Half Subtractor and Full Subtractor using data flow and structural modelling.
4. Design and simulation of 8-bit Ripple Carry Adder using structural and behavioural elements.
5. Design and simulation of 8:1 MUX and 1:8 DEMUX using **structural** and **behavioural** (**using Case Statement**) modelling.
6. Design and simulation of 3 to 8 Decoder and 8 to 3 Encoder using data flow and structural modelling.
7. Design of 4 bit ALU with addition, subtraction, multiplication, division, AND, OR, XOR and XNOR operations.

Design of Sequential Circuits:

8. Design and simulation of D-Latch (single-if statement) and D-flip-flop (if-else statement)
9. Design and simulation of 4 bit Up / Down counter using nested if-else-if statements.
10. Design and Simulation of 4-bit Shift Register behavioural modelling.

FPGA Implementation:

11. Pin Assignment, PAR, Bit file generation and Implement any of the combinational designs (Anyone of experiments 1 to 7) on target FPGA hardware.
12. Pin Assignment, PAR, Bit file generation and Implement any of the sequential designs (Anyone of experiments 8 to 10) on target FPGA hardware.

TOOLS REQUIRED:

1. Xilinx ISE or Later version
2. Personal Computers with Core i Processors with minimum 4 GB RAM.

COURSE OUTCOMES:

On successful completion of course the students will be able to		POs related to COs
CO1	Demonstrate knowledge on programming the combinational and sequential circuit designs	PO1
CO2	Analyze the functionality of digital circuits	PO2
CO3	Design the circuits which are used for successful implementation of simple & complex systems	PO3
CO4	Conduct investigation and test the functionality on implementation of combinational and sequential elements.	PO4
CO5	Select appropriate FPGA hardware and procedure to analyze and implement Digital circuits	PO5
CO6	Follow ethical principles in analyzing and implementing functionalities of various circuits	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue to update the skills related to the program for various applications during the life time.	PO12

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	2	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	--	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

IV Year B. Tech I semester	L	T	P	C
	2	1	0	3

18ECE411 MICROWAVE &OPTICAL COMMUNICATIONS

COURSE EDUCATIONAL OBJECTIVES

1.: To analyze the basic operation of klystron amplifier and reflex klystron oscillator.

2. To provide the knowledge on the operation of TWT & Magnetron

3. To provide the knowledge on of Solid state Microwave devices and Fundamentals of Optical Fiber Communication

4. To analyze the losses of fiber and power launching.

5. To inculcate skills on the operation of various optical detectors and the design of WDM components.

UNIT-1: KLYSTRON TUBES (9Hr)

Limitations And Losses of Conventional Tubes at Microwave Frequencies - Microwave Tubes - O Type And M Type Classifications - O Type Tubes – 2 Cavity Klystrons – Structure - Reentrant Cavities - Velocity Modulation - Process and Applegate Diagram - Bunching Process and Small Signal – Theory - Expressions for O/P Power And Efficiency. Reflex Klystron structure - Velocity Modulation - Applegate Diagram – Mathematical Theory of Bunching - Power Output - Efficiency - Oscillating Modes and O/P Characteristics - Effect of Repeller Voltage on Power O/P- Illustrative Problems.

UNIT-2: TRAVELLING WAVE TUBES AND MAGNETRONS (9Hr)

HELIX TWTS - Significance - Types and Characteristics of Slow Wave Structures; Structure of TWT And Amplification Process (Qualitative Treatment)

M -TYPE TUBES - Introduction - Cross Field Effects – Magnetrons - Cylindrical Travelling Wave Magnetron - Hull Cutoff And Hartree Conditions - Modes Of Resonance And PI-Mode Operation - O/P Characteristics - Illustrative Problems.

UNIT-3: TRAVELLING WAVE SOLID STATE DEVICES (9Hr)

MICROWAVE SOLID STATE DEVICES: Introduction – Classification – Applications - Transfer Electronic Devices - Gunn Diode – Principles - RWH Theory – Characteristics - Basic Modes of Operation - Gunn Oscillation Modes. LSA Mode.

INTRODUCTION TO OPTICAL FIBERS:

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Optical Propagation - Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode fibers-Graded Index fiber structure, Fiber materials.

UNIT – 4: SIGNAL DEGRADATION IN OPTICAL FIBERS: (9Hr)

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides- Dispersion - Group Delay-Dispersion–-Design Optimization of SM fibers-RI profile and cut-off wavelength.

FIBER OPTICAL SOURCES AND COUPLING:

Optical Sources-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, LASER Diodes-Modes and Threshold condition –Rate equations –External Quantum efficiency – Fiber –to- Fiber joints, Fiber splicing.

UNIT – 5: FIBER OPTICAL RECEIVERS: (9Hr)

Optical Detectors-PIN diode and APD diodes –Photo detector noise, SNR, –Comparison of Photo detectors – Fundamental Receiver Operation – Design of Analog Systems- Design of Digital Systems.

WDM COMPONENTS:

Coupler/Splitter, Isolators and Circulator, Mach Zehnder Interferometer, Fabry Perot Filter and Optical MEMS switches

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	**Design** a klystron amplifier and reflex klystron oscillator with required efficiency	PO1, PO2, PO3, PO4
CO2	**Analyze** the operation of TWT & Magnetron	PO1, PO2
CO3	**Analyze** the operation of Solid state Microwave devices and Demonstrate knowledge on fundamentals of Optical Fiber Communication.	PO1, PO2
CO4	**Analyze** the different Losses in Optical fiber.	PO1, PO2
CO5	**Analyze** the operation of various optical detectors and **design** of various WDM components.	PO1, PO4, PO5

TEXT BOOKS:

1. Microwave Devices And Circuits, 3 rd Edition, 2003, Samuel Y. Liao, Pearson, India.
2. Microwave and Radar Engineering, 3rd Edition, 2003, M. Kulakarni, Umesh Publications, New Delhi.
3. Optical Fiber Communication, 4th Ed., 2008, Gerd Keiser, MGH, New Delhi.
4. Optical Fiber Communications,. 3rd Impression- 2007, John M. Senior, Pearson Education, New Delhi.

REFERENCES:

1. Microwave Circuits And Passive Devices, 1995, M.L.Sisodia And G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd.
2. Microwave engineering passive circuits, 1999, Peter A.Rizzi, PHI.
3. Principles and Applications of Optical Communications, 2nd Ed., 2010, Max Ming, Kang Liu, TMH-.
4. Text book on optical fiber communication and its applications, 1st Ed., 2009, S.C.Gupta, PHI, New Delhi..
5. Fundamentals of Optical Fiber communications, 2009, Satish Kumar, PHI, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	2	2	-	-	-	-	-	-	-
CO*	3	2.2	3	2	2	-	-	-	-	-	-	-

IV Year B.Tech I Semester	L	T	P	C
	2	1	0	3

18ECE412 DIGITAL IMAGE PROCESSING

Course Educational Objectives:

1. To provide introduction to students the fundamentals of Digital .Image Processing system and its breadth and depth of the field ,to perform transformation o images.

2. To analyze the spatial and frequency domain enhancement techniques and students to apply. Appropriate algorithms to perform image enhancement in both spatial and frequency domain

3. To analyze the techniques and appropriate algorithms, to perform Image Degradation or Restoration & Image segmentation.

4. To Identify need For Image Compression and to acquire the fundamental knowledge on color image Processing

5. To understand the Principal Components for Description, Object Recognition in image processing.

UNIT 1: DIGITAL IMAGE FUNDAMENTALS & IMAGE TRANSFORMS (9Hr)

DIGITAL IMAGE FUNDAMENTALS Introduction to image processing- fundamental steps in digital image processing- components of image processing system- image sensing and acquisition- image sampling and quantization- some basic relationships between pixels .

IMAGE TRANSFORMS: 2-D DFT and Properties- Walsh transform- Hadamard Transform- Discrete cosine Transform - Haar transform- Slant transform.

UNIT 2: IMAGE ENHANCEMNT IN THE SPATIAL AND FREQUENCY DOMAIN (9Hr)

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Processing, Types of Point Processing, Histogram Processing, Linear and Non – Linear Gray Level Transformation, Median Filter, Spatial Domain High-Pass Filtering,

Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT 3: IMAGE DEGRADATION/RESTORATION&IMAGESEGMENTATION (9Hr)

Noise models- Restoration in the presence of noise only spatial filtering-mean order statistic and adaptive filters- estimating the degradation function- inverse filtering- wiener filtering- constrained least squares filtering. Point line and edge detection- thresholding- region based segmentation.

UNIT 4: IMAGE COMPRESSION & COLOR IMAGE PROCESSING (9Hr)

Need for image compression- classification of Redundancy in images- image compression models- classification of image compression schemes- Run length coding- arithmetic coding- block truncation coding - Color models-Color image processing.

UNIT 5: IMAGE REPRESENTATION AND OBJECT RECOGNITION (9Hr)

Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Object Recognition: Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Understand the concepts of image, image processing system and various operations that can perform on digital images, to perform transformations on images.	**PO1,PO2**
CO2	Analyze the images in the spatial domain and perform Enhancement in the Spatial Domain and frequency Domain	**PO1,PO2,PO3**
CO3	Select the adaptive filters for perform degradation/restoration process in the images ,Apply image segmentation on Edge Linking and Boundary Detection,	**PO1,PO2,PO3**
CO4	Identifying the Need for image compression, and discussing the concept of colour image fundamentals	**PO1,PO2,PO3**
CO5	Analyze Use of Principal Components for Description, Object Recognition	**PO1,PO2,PO3**

TEXT BOOKS:

1. Digital Image processing, 3rd Ed., 2010, R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson Education, New Delhi.
2. Fundamentals of Digital Image processing, Eastern Economy Edition, 2007, A.K.Jain, PHI, New Delhi.

REFERENCES:

1. Digital image processing, 1st Ed., 2009, S.jayaraman, S.Esakkirajan, T.Veerakumar, Tata McGraw Hill. New Delhi.
2. Digital Image processing using MAT LAB, 2004, Rafael C. Gonzalez, Richard E Woods and Steven, PEA, New Delhi.
3. Digital Image Processing, 3rd Ed., 2004, William K. Pratt, John Wilely, PHI, New Delhi.
4. Digital image processing and analysis, 1st Ed., 2006, B.chanda, Dutta Majumder, PHI private Limited, New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	3	2.8	2.75	-	-	-	-	-	-	-	-	-

IV Year B.Tech I Semester

L	T	P	C
2	1	0	3

18ECE413 MICRO-ELECTRO MECHANICAL SYSTEMS

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS Devices.
2. To educate on the rudiments of Micro fabrication techniques.
3.: To introduce various sensors and actuators
4. To introduce different materials used for MEMS
5. To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT 1: INTRODUCTION TO MICROSYSTEMS (9Hr)

Overview of microelectronics manufacture and Microsystems technology. Definition - MEMS materials - Laws of scaling - The multi disciplinary nature of MEMS - Survey of materials central to micro engineering - Applications of MEMS in various industries.

UNIT 2: MICRO SENSORS AND ACTUATORS (9Hr)

Working principle of Microsystems - micro actuation techniques - micro sensors – types – Micro actuators – types – micropump – micromotors – micro – valves – micro grippers – micro accelerometers.

UNIT 3: FABRICATION PROCESS (9Hr)

Substrates - single crystal silicon wafer formation – Photolithography – Ion implantation – Diffusion – Oxidation – CVD - Physical vapor deposition - Deposition epitaxy - etching process.

UNIT 4: MICRO SYSTEM MANUFACTURING (9Hr)

Bulk Micro manufacturing - surface micro machining – LIGA – SLIGA - Micro system packaging materials - die level - device level - system level - packaging techniques – die preparation – surface bonding - wire bonding - sealing.

UNIT 5: MICROSYSTEMS DESIGN AND PACKAGING (9Hr)

Design considerations, Mechanical Design, Process design, Realization of MEMS components using intellisuite. Micro system packaging, Packing Technologies, Assembly of Microsystems, Reliability in MEMS.

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Be familiar with the important concepts applicable to MEMS, their fabrication.	PO1, PO2
CO2	Be fluent with the design, analysis and testing of MEMS.	PO1, PO2, PO3
CO3	To educate on the rudiments of Micro fabrication techniques.	PO1, PO2, PO4
CO4	To introduce different materials used for MEMS.	PO1, PO2, PO3,PO4
CO5	Apply the MEMS for different applications.	PO1,PO2,PO3

TEXT BOOKS

1. "MEMS and Microsystems Design and Manufacture" by Tai-Ran Hsu. Tata McGraw-Hill Publishing Company Ltd.
2. "Foundation of MEMS" by Chang Liu. Pearson Education.
3. 'Microsystem Design', by Stephen D Senturia, Springer Publication, 2000.
4. Rai - Choudhury P. "MEMS and MOEMS Technology and Applications", PHI Learning Private Limited, 2009.

REFERENCES:

1. Francis E.H. Tay and Choong .W.O, "Micro fluidics and Bio mems application", IEEE Press New York, 1997.
2. Trimmer William S., Ed., "Micromechanics and MEMS", IEEE Press New York, 1997.
3. Maluf, Nadim, "An introduction to Micro electro mechanical Systems Engineering", AR Tech house, Boston 2000.
4. Julian W.Gardner, Vijay K.Varadan, Osama O. Awadel Karim, "Micro sensors MEMS and Smart Devices", John Wiby & sons Ltd., 2001.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	-	1	-	-	-	-	-	-	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-
CO*	3	1.8	1.3	1	-	-	-	-	-	-	-	-

IV Year B.Tech I Semester	L	T	P	C
	3	0	0	3

18ECE414A COMPUTER NETWORKS ((Core Elective - I))

Course Educational Objectives:

1. To provide an opportunity to do network programming using TCP/IP.
2. To familiarize with the basic taxonomy and terminology of computer networking area.
3. To analyze the functions of each layer and gain knowledge in different applications that use computer networks.
4. To be familiar with contemporary issues in networking technologies
5. Students are also introduced to the areas of Network Security and Mobile Communications.

UNIT- I NETWORK MODELS (9Hr)

Introduction to Networks- LAN, MAN and WAN- Internet,- Protocols and standards- The OSI/ISO reference model- TCP/IP protocol suite- ATM protocol reference model-ATM layers.
Physical Layer: Multiplexing, Transmission Media, SONET/SDH architecture-switching concepts.

UNIT- II DATA LINK LAYER (9Hr)

Design Issues- Error detection and correction- Stop and wait protocol- Sliding window protocols- Example of Data Link protocols.
The MAC sublayer: the channel allocation problem- multiple access protocols- Wireless LANS- Bridges-FDDI.

UNIT- III NETWORK LAYER (9Hr)

Design Issues- Routing Algorithms-Congestion control Algorithms-Internetworking-the Network Layer in the internet.

UNIT – IV TRANSPORT LAYER (9Hr)

Transport service-Elements of Transport protocols- The internet Transport protocols.

UNIT – V APPLICATION LAYER (9Hr)

Domain Name System-Electronic Mail- File Transfer Protocol- WWW- HTTP-SNMP- Multi-Media.
Network Security: Cryptography-secret and public key algorithm.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	To contrast the protocol architectures such as OSI and TCP/IP	PO1, PO2
CO2	To understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks.	PO1, PO2
CO3	To design a network routing for IP networks.	PO1,PO2,PO3,PO4
CO4	To apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.	PO1,PO3,PO4
CO5	To understand internals of main protocols such as HTTP, FTP, SMTP, TCP, UDP, IP.	PO1, PO2

TEXT BOOKS:

1. **"**Computer Networks**"**- Computer Networks, Andrew S. Tanenbaum, 4e, Pearson Education.
2. Data Communications and Networking: Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education.

REFERENCE BOOKS:

1. Computer Networks-Principles, Technologies and Protocols for Network Design, Natalia Olifer, Victor Olifer, Wiley India.
2. Computer and Communication Networks, Nader F. Mir, Pearson Education.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, 3rd Edition, Pearson Education.
4. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-
CO3	2	1	2	1	-	-	-	-	-	-	-	-
CO4	3	-	2	2	-	-	-	-	-	-	-	-
CO5	3	1	-	-	-	-	-	-	-	-	-	-
CO*	2.8	1	2	1.5	-	-	-	-	-	-	-	-

IV Year B-Tech I semester	L	T	P	C
	3	0	0	3

18ECE414B CELLULAR & MOBILE COMMUNICATIONS (Core Elective - I)

Course Educational Objectives:

1. To provide knowledge on
   - Understanding cellular concept
   - Elements of cellular system
   - Frequency Reuse
2. To provide the student with an understanding of Co-channel interference, Non- Co- channel Interference.
3. To inculcate skill to investigate the effect of cell coverage for signal and traffic, Frequency and channel assignment.
4. To develop skill to understand types of Antennas, Handoff strategies.
5. Analyse Architecture of GSM, channels and 3G cellular systems.

UNIT I: Introduction to Cellular Mobile Radio Systems (9Hr)

Limitations of Conventional Mobile Telephone systems, Spectrum Allocation, Performance Criteria, Basic Cellular Mobile System, Operation of cellular systems, Hexagonal shaped cells, Analog and Digital cellular systems.

Fundamentals of Cellular Radio system Design

Concept of Frequency Reuse, Frequency Reuse ratio, Cellular Traffic: Trunking and Blocking, Grade of Service; Improving Coverage and Capacity in cellular systems: Cell Splitting, Sectoring, Micro Cell Zone concept.

UNIT 2: Interference (9Hr)

Types of Interferences, Introduction to Co- Channel Interference, Real time Co-channel interference, Co-channel interference Reduction factor, Desired C/I from a normal case in a Omni Directional Antenna system, Design of Antenna system, Antenna parameters and their effects, diversity Techniques, Non-co-channel interference-different types.

UNIT 3: Frequency Management and Channel Assignment (9Hr)

Numbering and grouping, setup access and paging channels, channel assignment to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, Non fixed channel assignment.

Cell Coverage for Signal and Traffic

Signal reflections in flat and Hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, General formula for mobile propagation over water and flat open area, near and long distance propagation, antenna height gain, point to point model.

UNIT 4: Cell Site and Mobile Antennas (9Hr)

Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, Space Diversity Antennas, Umbrella Pattern Antennas, Minimum separation of cell site Antennas, High gain Antennas.

Handoff strategies

Handoff Initiation , Delaying a Handoff, forced handoff, mobile assisted handoff, intersystem handoff, Introduction to Dropped Call Rates and their Evaluation

UNIT 5 : Digital Cellular Networks **(9Hr)**

Multiple access schemes; TDMA, CDMA, OFDMA, GSM architecture, GSM channels, Architecture of 3G cellular systems, Differences between 4G & 5G Cellular communications.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Identify the Limitations of Conventional telephone systems, Understand the concepts of Cellular systems	PO1, PO2
CO2	Identify various propagation effects and understand the concept of Interference both Co channel and Adjacent channel interference .	PO1, PO2, PO3
CO3	Analyze the concept of Frequency management, Signal reflections in flat and hilly terrain.	PO1, PO2,PO3
CO4	Understand the different types of antennas for interference reduction, Handoff strategies in cellular systems.	PO1, PO2,PO4
CO5	Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations	PO1,PO2

TEXT BOOKS:

1. Mobile cellular Telecommunications-W.C.Y.Lee, 2nd edition, Tata Mc-Graw Hill, New Delhi, 2006.
2. Wireless communications-Theodre S.Rapport, 2nd edition, Pearson Education, 2002.

REFERENCE BOOKS:

1. Principles of Mobile communications-Gordon L.Stuber, 2nd Edition, Springer International, 2007.
2. Wireless communications and Networking-Jon W.Mark and weihua Zhqung, PHI
3. Wireless communication Technology-R.Blake, Thompson Asia Pvt. Ltd, 2004
4. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Eduction. 2005.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2	2	2	-	-	-	-	-	-	-	-

IV B.Tech I Semester	L	T	P	C
	3	0	0	3

18ECE414C ADVANCED DIGITAL SIGNAL PROCESSING (Core Elective I)

COURSE EDUCATIONAL OBJECTIVES:

1. To bring out the concepts related to wide sense stationary process.
2. To emphasize the importance of true estimation of power spectral density.
3. To understand the concept of Bartlett, Welch & Blackman-Tukey methods.
4. To understand the design of AR models & Burg methods
5. To understand the concept of Multi Rate Signal Processing & its application.

UNIT –I DISCRETE RANDOM SIGNAL PROCESSING (9Hr)

Wide sense stationary process – Ergodic process – Mean – Variance - Auto-correlation and Auto-correlation matrix - Properties - Weiner Khitchine relation - Power spectral density – filtering random process, Spectral Factorization Theorem–Finite Data records.

UNIT -II NON-PARAMETRIC METHODS (9Hr)

Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT - III PARAMETRIC METHODS (9Hr)

Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT –IV MULTI RATE SIGNAL PROCESSING (9Hr)

Introduction, Decimation by a factor D, Interpolation by afactor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion. Examples of up-sampling using an All Pass Filter.

UNIT –V APPLICATIONS OF MULTI RATE SIGNAL PROCESSING (9Hr)

Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of course the students will be able to		POs related to COs
CO1	Demonstrate knowledge on Wide sense stationary process – Ergodic process, Analyze Weiner Khitchine relation - Power spectral density	**PO1, PO2.**
CO2	Analyze and design of Non-parametric Methods- Bartlett, Welch & Blackman-Tukey methods	**PO1, PO2, PO3.**
CO3	Understand the Relation between auto correlation & model parameters, analyze and design of AR, MA, ARMA models.	**PO1, PO2, PO3.**
CO4	Understand the Decimation by a factor D, Interpolation by a factor I, analyze and design of Filter for sampling rate conversion.	**PO1, PO2, PO3, PO4.**
CO5	Analyze and design of Narrow Band Low Pass Filters & Digital Filter Banks.	**PO1, PO2, PO3, PO4.**

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis& D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time signal processing - Alan V Oppenheim & Ronald W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 ed., Pearson Education.

REFERENCE BOOKS:

1. Modern spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing: A Practitioner's Approach, Kaluri V. Rangarao, Ranjan K. Mallik ISBN: 978-0-470-01769-2, 210 pages, November 2006 John Weley.
4. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	3	2	2	2	-	-	-	-	-	-	-	-

IV Year B-Tech I semester	L	T	P	C
	3	0	0	3

18ECE414D PARALLEL & DISTRIBUTED COMPUTING (Core Elective I)

COURSE EDUCATIONAL OBJECTIVE:

1. To cover parallel & distributed computing architecture, networked clusters of Computers, utilization and management of the expensive remote resources.
2. To present the principles underlying the functioning of concurrent and Distributed systems;
3. To create an awareness of the technical challenges in concurrent and Distributed systems design and implementation
4. To familiarizes the concepts of distributed network architecture and design challenges
5. To understand the concept of distributed computing method and tools and analysis it with greater insight

UNIT I INTRODUCTION (9Hr)

Introduction to distributed computing system, evolution different models, gaining popularity, definition, issues in design, DCE, message passing –introduction, desirable features of a good message passing system, issues in IPC, synchronization, buffering, multigram messages, encoding and decoding of message data, process addressing, failure handling, group communication.

UNIT II REMOTE PROCEDURE CALLS (9Hr)

Introduction, model, transparency, implementation mechanism, stub generation, RPC messages, marshalling arguments and results, server management, parameter - passing semantics, call semantics, communication protocols for RPCs, client – server binding, exception handling, security, mini project using Java RMI

UNIT III DISTRIBUTED SHARED MEMORY (9Hr)

General architecture of DSM systems, design and implementation issues of DSM systems, granularity, structure of shared memory space, consistency model, replacement strategy, thrashing, advantages of DSM, clock synchronization DFS and security- Desirable features of good DFS, file models, file accessing Models, file sharing semantics, file catching schemes, file replication, fault Tolerance, atomic transaction, potential attacks to computer system, cryptography, authentication, access control. Digital signatures, DCE security service

UNIT IV PARALLEL AND DISTRIBUTED COMPUTING (9Hr)

Operating Systems, Client-Server Model, Distributed Database Systems, Parallel Programming Languages and Algorithms. Distributed Network Architectures- Managing Distributed Systems. Design Considerations

UNIT V METHODS AND TOOLS (9Hr)

For development, implementation & evaluation of distributed information systems, workflow, software processes, transaction management, and data modelling, infrastructure e.g. middle-ware to glue heterogeneous, autonomous, and partly mobile/distributed data systems, such as e.g. client/server-, CORBA-, and Internet-technologies. Methods for building distributed applications.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of course the students will be able to		POs related to COs
CO1	Acquire a sound knowledge and understand the construction of concurrent and distributed systems	PO1, PO2,PO3
CO2	Model, construct and analyze basic concurrent and distributed systems.	PO1, PO2, PO3
CO3	Adapt analytical approach to the construction of software	PO1, PO2,PO3
CO4	Develop methods tools for parallel computing	PO1, PO2,PO4,PO5
CO5	Understands the applications of distributed and parallel computing	PO1,PO2,PO5,PO9

TEXT BOOK AND REFERENCE BOOKS:

1. Pradeep K. Sinha, "Distributed Operating Systems: Concepts &Design", 2007
2. Crichlow Joel M, "An Introduction to Distributed and Parallel Computing", PHI, 1997
3. Black Uyless, "Data Communications and Distributed Networks",
PHI, 5th Edition, 1997

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	3	3	-	-	-	-	-	-	-
CO5	3	2	-	-	3	-	-	-	2	-	-	-
CO*	2.8	2.6	2	3	3	-	-	-	2	-	-	-

IV Year B. Tech I semester	L	T	P	C
	3	0	0	3

18ECE414E FUNDAMENTALS OF NANO- ELECTRONICS (Core Elective – I)

1. To learn and understand basic concepts of Nano electronics.
2. To know the techniques of fabrication and measurement for nanostructures.
3. To gain knowledge about Nanostructure devices and logic device Nano Electronics and Nano Micro fabrication.
4. To understand the fundamentals of Electron transport in semiconductors and Nanostructures.
5. To analyze the Electron Devices for Logic Applications.

UNIT – 1 INTRODUCTION TO NANOELECTRONICS (9Hr)

Microelectronics towards bio molecule electronics-Particles and waves- Wave-particle duality- Wave mechanics- Schrödinger wave equation- Wave mechanics of particles: – Atoms and atomic orbitals- Materials for nano electronics- Semiconductors- Crystal lattices: Bonding in crystals- Electron energy bands- Semiconductor hetero structures.

UNIT – 2 FABRICATION AND MEASUREMENT TECHNIQUES (9Hr)

Growth, fabrication, and measurement techniques for nanostructures- Bulk crystal and hetero structure growth- Nanolithography, etching, and other means for fabrication of nanostructures and nano devices- Techniques for characterization of nanostructures- Spontaneous formation and ordering of nanostructures.

UNIT –3 PROPERTIES (9Hr)

Dielectrics-Ferroelectrics-Electronic Properties and Quantum Effects-Magneto electronics – Magnetism and Magneto transport in Layered Structures-Organic Molecules – Electronic Structures, Properties, and Reactions-Neurons – The Molecular Basis of their Electrical Excitability-Circuit and System Design.

UNIT – 4 NANO STRUCTURE DEVICES (9Hr)

Electron transport in semiconductors and nanostructures- Time and length scales of the electrons in solids- Statistics of the electrons in solids and nanostructures- Density of states of electrons in nanostructures- Electron transport in nanostructures-Electrons in traditional low-dimensional structures- Electrons in quantum wells.

UNIT – 5 LOGIC DEVICES AND APPLICATIONS (9Hr)

Logic Devices-Silicon MOSFETs-Ferroelectric Field Effect Transistors-Quantum Transport Devices Based on Resonant Tunnelling-Single-Electron Devices for Logic Applications-Superconductor Digital Electronics-Quantum Computing Using Superconductors-Carbon Nano tubes for Data Processing-

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	To understand and analyze the fundamental physics of nano electronics	PO1
CO2	Describe deep insight to fabrication and characterization techniques in nanostructures.	PO1,PO2
CO3	Discuss various Properties of electrons in nanostructures	PO1,PO2
CO4	Familiarize with concepts of electronic transport in nanostructures.	PO1
CO5	Demonstrate the working of various nano electronics devices	PO1,PO2,PO3

TEXT BOOKS:

1. Stephen D. Sentaria, Microsystem Design, Kluwer Academic Press
2. Marc Madou,Fundamentals of microfabrication & Nanofabrication.
3. T. Fukada & W.Mens, Micro Mechanical system Principle & Technology, Elsevier, 1998.
4. Julian W.Gardnes, Vijay K. Varda, Micro sensors MEMS& Smart Devices, 2001.

REFERENCES:

1. Vladimir V. Mitin, Viatcheslav A. Kochelap, Michael A. Stroscio, “Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications”, Cambridge University Press 2011
2. Supriyo Datta,“Lessons from Nanoelectronics: A New Perspective on Transport”, World Scientific2012
3. George W. Hanson,“Fundamentals of Nanoelectronics”, Pearson 2009
4. Korkin, Anatoli; Rosei, Federico (Eds.), “Nanoelectronics and Photonics”,Springer 2008

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	3	2.3	2	-	-	-	-	-	-	-	-	-

IV Year B.Tech I semester	L	T	P	C
	3	0	0	3

18ECE415A FPGA DESIGN (Core Elective II)

COURSE EDUCATIONAL OBJECTIVES:

1. To learn about the use of FPGAs in digital design and the full FPGA design flow.
2. To be able to design ASM, Boolean Implementation with minimal resources.
3. To acquire knowledge on timing issues, violation and analysis of issues. Designs with eliminated issues.
4. To gain the knowledge and demonstrate the architectural as well as functional aspects of FPGAs.
5. To apply the concepts of FPGA design in implementing various logic circuits.

UNIT I DESIGN WITH FPGA (9Hr)

Digital IC design flow - The role of FPGAs in digital design – Goals and techniques – Hierarchical design- CAD Tools.

UNIT 2 DIGITAL SYSTEM DESIGN (9Hr)

The ASM chart - design from an ASM chart : Boolean implementation for minimal number of Flip-Flops - design from an ASM chart: One-Hot controller implementation : state table entry to a PLD

UNIT 3 TIMING ISSUES (9Hr)

Clock skew in state machines -Initialization and lockout in state machines. CLOCKING AND METASTABILITY: Set up time hold time – setup time hold time violations - critical path - calculation of maximum clock frequency – meta-stability - synchronizers – design examples.

UNIT 4 FPGA ARCHITECTURES (9Hr)

FPGA architectures – Configurable logic blocks - Configurable I/O blocks – Programmable interconnect – clock circuitry – Xilinx FPGA architecture – Programming Technologies: Anti-fuse, SRAM, EPROM, EEPROM.

UNIT 5 LOGIC IMPLEMENTATION FOR FPGAs (9Hr)

Logic synthesis - logic optimization - simulation – types of simulation – physical design for FPGAs: placement, routing - testing – need for testing, testing methods - Goals and objectives - low power techniques – Design examples: Traffic light controller, score board and controller, keyboard scanner and controller.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Translate a software application into hardware logic for FPGA architectures.	PO1, PO2 ,PO3, PO4
CO2	Demonstrate knowledge and design of ASM concepts.	PO1, PO2, PO4
CO3	Analyze the timing issues related to sequential logic implementation.	PO1, PO2, PO4
CO4	Analyze and understand the concepts of FPGA Architectures.	PO1, PO2, PO4
CO5	Understand and apply the concept of FPGA design in various logic implementations.	PO1, PO2, PO4

TEXT BOOKS:

1. Morris Mano,"Logic and computer design fundamentals",4-edition,Pearson Education,2008
2. Samir Palnitkar, "Verilog HDL: A guide to digital design and synthesis" Pearson Education India, 2010.

REFERENCES:

1. Zainalabedin Navabi," Verilog Digital System Design", Tata McGraw Hill, New Delhi, 2010.
2. Roth and John," Principles of digital systems design", Cengage learning, 2010.
3. Bhasker J "A Verilog HDL Primer", BS Publications, 2007.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-
CO4	2	2	-	1	-	-	-	-	-	-	-	-
CO5	2	1	-	1	-	-	-	-	-	-	-	-
CO*	2.6	2	3	1.6		-	-	-	-	-	-	-

IV Year B.Tech I semester

L	T	P	C
3	0	0	3

18ECE415B ROBOTICS AND AUTOMATION **(Core Elective II)**

Course Educational Objectives:

1. To provide knowledge on basics of robotics.
2. To provide knowledge on power sources and sensors
3. To study about manipulators, actuators and grippers
4. To study about path planning for automation
5. To learn through case studies.

UNIT - 1: BASIC CONCEPTS (9Hr)

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov"s laws of robotics – dynamic stabilization of robots.

UNIT - 2: POWER SOURCES AND SENSORS (9Hr)

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT - 3: MANIPULATORS, ACTUATORS AND GRIPPERS (9Hr)

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT - 4: KINEMATICS AND PATH PLANNING (9Hr)

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

UNIT - 5: CASE STUDIES (9Hr)

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Describe various basic concepts of working of robot.	PO1, PO2
CO2	Analyze the function of sensors and power sources in the robot	PO1, PO2
CO3	Describe the construction of manipulators and grippers	PO1, PO2
CO4	Write program to use a robot for a typical application through path planning	PO1, PO2
CO5	Interfacing robots and use in different applications	PO1, PO2

TEXT BOOKS:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "Industrial Robotics", Mc Graw-Hill Singapore, 1996.

2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai,1998.

REFERENCES:

1. Deb. S.R.,"Robotics Technology and flexible Automation", John Wiley, USA 1992.

2. Klafter R.D., Chimielewski T.A., Negin M., "Robotic Engineering – An integrated approach", Prentice Hall of India, New Delhi, 1994.

3. Mc Kerrow P.J. "Introduction to Robotics", Addison Wesley, USA, 1991.

4. Issac Asimov "Robot", Ballantine Books, New York, 1986.

5. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing, 1987.

6. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, "Industrial Robotics Technology, Programming and Applications ", McGraw Hill Book Company 1986.

7. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., "Robotics Control Sensing, Vision and Intelligence" McGraw Hill International Editions, 1987.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	2.2	-	-	-	-	-	-	-	-	-	-

IV Year B.Tech I semester

L	T	P	C
3	0	0	3

18ECE415C MEDICAL ELECTRONICS (Core elective -II)

Course Educational objectives:

1. To gain knowledge and analyze the various physiological parameters and its recording methods, signal characteristics.
2. To understand the respiratory, Blood pressure, temperature measurements etc.
3. To study about the various assist devices used in the hospitals.
4. To gain knowledge about equipment used for physical medicine and the various recently Developed diagnostic and therapeutic techniques.
5. To Know the recent trends in tele medicine and laser in medicine.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING (9Hr)

The origin of Bio-potentials; bio potential electrodes, biological amplifiers, ECG, EEG, EMG,PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT (9Hr)

pH, PO2, PCO2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III ASSIST DEVICES (9Hr)

Cardiac pacemakers, DC Defibrillator, Dialyzer, Heart lung machine

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY (9Hr)

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION (9Hr)

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to		**POs related to COs**
CO1	Distinguish and analyze the various physiological parameters and its recording methods, signal characteristics.	PO1,PO2
CO2	Describe the respiratory, Blood pressure, temperature measurements etc.	PO1,PO2,PO5
CO3	Analyze function of various assist devices used in the hospitals.	PO1,PO2, PO5
CO4	Demonstrate knowledge about equipment used for physical Medicine and the various recently developed diagnostic and therapeutic techniques.	PO1,PO2, PO5
CO5	Extend knowledge on recent trends in tele medicine and laser in medicine.	PO1,PO2, PO5

TEXT BOOKS:

1. Leslie Cromwell, ―Biomedical instrumentation and measurement‖, Prentice Hall of India, New Delhi, 2007.
2. John G.Webster,‖ Medical Instrumentation Application and Design‖, 3rd Edition, Wiley India Edition, 2007

REFERENCES:

1. Khandpur, R.S., ―Handbook of Biomedical Instrumentation‖, TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, ―Introduction to Biomedical equipment Technology‖, John Wiley and Sons, New York, 2004.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	3	3	-	-	2	-	-	-	-	-	-	-
CO4	3	3	-	-	2	-	-	-	-	-	-	-
CO5	3	3	-	-	2	-	-	-	-	-	-	-
CO*	**3**	**3**	-	-	**2**	-	-	-	-	-	-	-

IV Year B. Tech I semester **L T P C**
3 0 0 3

18ECE415D WIRELESS COMMUNICATIONS NETWORK (Core Elective II)

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge on
- Understanding Basics of wireless communications.
- Generations of Wireless networks
- Multiple Access Schemes

2. To provide the student with an understanding of Mobile IP, GSM architecture.
3. To inculcate skill to learn about different wireless data services, Access protocols.
4. To develop skill to understand the architecture of Bluetooth and its protocols.
5. Analyse students about Wireless LAN architectures and operation.
.

UNIT - I: INTRODUCTION TO WIRELESS NETWORKING (9Hr)

Introduction to Wireless Networks, Difference between wireless and fixed telephone networks, Development of wireless networks. Traffic routing in wireless networks.

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction, FDMA, TDMA, Spread Spectrum, Multiple Access, SDMA, Packet radio, Packet radio protocols.

UNIT - II: MOBILE IP& MOBILE DATA NETWORKS (9Hr)

Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling, , GPRS and higher data rates, Short Messaging service in GSM ,Mobile application protocol.

UNIT - III: WIRELESS DATA SERVICES (9Hr)

CDPD, ARDIS, RMD, Common channel signalling, ISDN, BISDN, SS7, SS7 user part, signaling traffic in SS7.

WIRELESS ACCESS PROTOCOL: WAP Architecture, overview, WML scripts, WAP service,WAP session protocol, wireless transaction, Wireless datagram protocol.

UNIT -IV: BLUE TOOTH (9Hr)

Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol. Introduction to WLL Technology.

UNIT-V: WIRELESS LAN TECHNOLOGY (9Hr)

Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs,IEEE802.11 architecture and services.

Wireless ATM & HIPER LAN: Introduction, Wireless ATM, HIPERLAN, Adhoc Networking and WPAN.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	To understand the Basics of wireless communications and types of Multiple access techniques.	PO1, PO2
CO2	Understand Mobile IP, collocated address & knowledge on Mobile data Networks.	PO1,PO2
CO3	Analyze the concept of Wireless data services, WML scripts.	PO1, PO2,PO3
CO4	Illustrate the architecture of Bluetooth and Wireless Local Loop technology.	PO1, PO2,PO4
CO5	Evaluate the Types of LANs and Analyze the Concept of Wireless ATM.	PO1,PO2

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore S.Rappaport, PHI, 2nd Ed., 2002.
2. Wireless Communication and Networking – William Stallings, PHI,2003.

REFERENCES:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.
3. Wireless Communications – Andreaws F. Molisch, Wiley India,2006.
4. Introduction to Wireless and Mobile Systems – Dharma Prakash Agarwal, Qing-An Zeng, Thomson 2nd Edition, 2006.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-		-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2	2	2	-	-	-	-	-	-	-	-

IV Year B.Tech I semester **L T P C**

3 0 0 3

18ECE415E TELEVISION ENGINEERING (Core Elective- II)

COURSE EDUCATIONAL OBJECTIVES:

1. To familiarize with the television standards and principles
2. To demonstrate knowledge on the concepts of signal
Transmission, propagation, principles of cameras and picture tubes
3. To know the operation of monochrome and color Television system
4. To analyse the operation of color signal decoding
5. To summarise the concepts of digital TV engineering

UNIT I: INTRODUCTION (9Hr)

TV transmitter and receivers - synchronization. Television Pictures: Geometric form and aspect ratio - image continuity - interlaced scanning - picture resolution - Composite video signal: Horizontal and vertical sync - scanning sequence. Colour signal generation and Encoding: Perception of brightness and colours - additive colour mixing - video signals for colours - luminance signal - colour difference signals - encoding of colour difference signals - formation of chrominance signal PAL encoder.

UNIT 2: TV SIGNAL TRANSMISSION AND PROPAGATION (9Hr)

Picture signal transmission - positive and negative modulation - VSB transmission - sound signal transmission - standard channel BW - TV transmitter - TV signal propagation - interference - TV broadcast channels.

TV Cameras : Camera tube types - Vidicon - Silicon Diode Array Vidicon - Monochrome TV camera - color camera. CCD Image Sensors.

Picture Tubes : Monochromatic Picture tube - Electrostatic focussing - Beam deflection - picture tube characteristics and specifications - colour picture tubes. 625 -line monochrome system - PAL colour system - TV standards.

UNIT 3: MONOCHROME AND COLOUR TV RECEIVER (9Hr)

RF tuner - IF subsystem - video amplifier - sound section - syncs separation and processing - deflection circuits - scanning circuits. PAL -D Colour Receiver: Electronic tuners - IF subsystem - Y -signal channel - Chroma decoder - Separation of U & V Colour Phasors - synchronous demodulators - Subcarrier generation - raster circuits.

UNIT 4: IF SUBSYSTEM and COLOUR SIGNAL DECODING (9Hr)

TV Receiver Tuners: Tuner operation - VHF and UHF tuners - digital tuning techniques - remote control of receiver functions.

PAL – D decoder - chroma signal amplifiers - separation of U and V signals - Color burst separation - Burst phase discriminator - ACC amplifier - Indent and colour killer circuits - RO phase shift and 180^{o} PAL–SWITCH circuitry - U & V demodulator- colour signal mixing.

UNIT 5: DIGITAL TV Technology: (9Hr)

LCD-TV ,LED TV, Smart TV and Organic LED(OLED) TV RECEIVERS -working principle, operation and applications ,HD technology, tele conference method,DTH operation.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Understand the concept of television standards, transmitter and receivers	PO1, PO2,PO3
CO2	Demonstrate the knowledge on signal transmission ,cameras and picture tubes	PO1, PO2, PO3,
CO3	Analyse the differences between monochrome and colour tv receiver	PO1, PO2, PO3,
CO4	Demonstrate the knowledge on colour signal decoding and IF sub system	PO1, PO2, PO3
CO5	Acquire the knowledge on different digitally operated TV receivers	PO1, PO2, PO3

TEXT BOOKS:

1. Modern Television Practice – Principles - Technology and Service –2nd edition , 2002, R.R. Gulati, New Age International Publication, New Delhi.
2. Monochrome and Colour TV –3rd edition ,2002 , R.R. Gulati ,New Age International Publication , New Delhi.

REFERENCES:

1. Colour Television Theory and Practice –6th edition , 1998 ,S.P. Bali, TMH ,New Delhi.
2. Television Engineering and Video Systems –1st edition, 2007, R.G.Gupta, TMH,New Delhi
3. Basic Television and Video Systems – 1st edition, 1999 , B. Grob and C.E. Herndon , McGraw Hill, New Delhi.
4. Television and video Engineering –2nd edition, 1995,A M Dhake,TMH,New Delhi

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	3	2.4	2	-	-	-	-	-	-	-	-	-

IV B. Tech I-Semester

L	T	P	C
3	1	0	3

18OSAH411 GRAPH THEORY WITH APPLICATIONS(Open Elective-II)
(Common to all Branches)

Course Educational Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. To learn the representation of graphs and understanding the Graph Isomorphism, Sub graph-Vertex degrees, Walk, Paths, Cycles-graph connection, Bipartite graphs.
3. To understand the Trees concepts, digraphs, binary relations, Shortest path algorithms and to familiarize the knowledge of graph theory
4. To understand the matrix representation of graphs, designing incidence matrix, Adjacency matrix and circuit matrix
5. To explore the use of graphs in various applications in Switching and Coding Theory
6. To identify the important graph based real time applications of electrical networks such as RLC Networks with Independent sources, LOOP circuits

UNIT – 1: Graph Theory Introduction (9Hr)

Graph and simple graphs (Complete graphs, Complement of graph)- Graph isomorphism–Sub graph- Vertex degrees, walk, paths, cycles-graph connection and components-Bipartite graphs.

UNIT – 2: Directed graphs and shortest path algorithms (9Hr)

Trees – Cut edges- Cut vertices-Blocks , Directed graphs types of directed graphs - digraphs and binary relations – directed paths and connectedness - Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm

UNIT – 3: Matrix Representation of graphs (9Hr)

Introduction - Adjacency matrix -Applications of Adjacency matrix-sufficient condition for isomorphism of graphs-power of an adjacency matrix-Adjacency matrix of a digraph-incidence matrix-circuit matrix-cut set matrix.

UNIT - 4: Graphs in Switching and Coding Theory (9Hr)

Contact Networks – Analysis of Contact Networks – Synthesis of Contact Networks – Sequential Switching Networks – Unit Cube and its Graph – Graphs in Coding Theory.

UNIT – 5: Electrical Network analysis by Graph Theory (9Hr)

Introduction - Kirchhoff's current and Voltage laws-Loop currents and Node Voltages- RLC Networks with Independent sources: Nodal analysis, Loop analysis.

Course Outcomes:

After the completion of this course, a successful student is able to

Course Outcomes		POs related to Cos
CO1	Demonstrate knowledge in reading and writing rigorous mathematical proofs involving introductory aspects of graphs and develop analytical skills in solving graph theoretic problems	PO1,PO2,PO3 PO4
CO2	Demonstrate knowledge in Trees concepts, digraphs, binary relations, and Develop analytical skills in solving problems involving directed graphs and shortest path algorithm	PO1,PO2,PO3 PO4
CO3	Demonstrate knowledge in matrix representation of graphs, designing incidencematrix, Adjacency matrix and circuit matrix and explore analytical skills in solving problems involving adjacency matrix and incidence matrix	PO1,PO2,PO3 PO4
C04	Demonstrate knowledge in significant practical applications of graphs in Switching and Coding Theory; explore analytical skills in solving practical problems using graph theory concepts and Develop skills in designing Mathematical models for real time applications in coding theory.	PO1,PO2,PO3 PO4
CO5	Demonstrate knowledge in significant real time applications of electrical networks such as RLC Networks Independent sources; explore analytical skills in solving practical problems involving using graph theory concepts and Develop skills in designing Mathematical models for real time electrical networks.	PO1,PO2,PO3 PO4

Text Books:

1. Discrete mathematical structures with applications to computer science. J.P.Trimblay and R.Manohar , 27/e, Tata Mc Graw Hill Publications , 2006, New Delhi.

2. Graph Theory with applications to engineering and computer Science, NarasinghDeo, 25/e, Printice – Hall of India Private Limited, 2003, New Delhi

References:

1. Clark J. And Holton D.A., " A first look at Graph theory", Allied Publishers, 199
2. R.B.Bapat , Graphs and Matrices, Springer, London Dordrecht Heidelberg, New York, 2010 .
3. Gary Haggard John Schlipf, Sue Whitesides, Discrete Mathematics for Computer Science, 4/e, 2007, Thomson Publication, 2008, New Delhi.
4. S.D Sharma ,KedarNath Ram Nath Operation Research & Co, Meerut . 2007.
5. J.A.Bonday and U.S.R. Murty, Graph Theory with application (2nd Edition), North Holland, 1976 .

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	3	2	-	-	-	-	-	-	-	-
CO.2	3	3	3	2	-	-	-	-	-	-	-	-
CO.3	3	3	3	2	-	-	-	-	-	-	-	-
CO.4	3	3	3	2	-	-	-	-	-	-	-	-
CO.5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	2	-	-	-	-	-	-	-	-

IV B. Tech I-Semester

L	T	P	C
3	0	0	3

18OSAH412 BANKING AND INSURANCE(Open Elective-II)

Course Educational Objectives:

1. To introduce students to the banking sector and its operations.
2. To provide elaborate knowledge on functions of banking
3. To enable students to understand the digital technology in banking
4. To provide an understanding of insurance and risk management
5. To enable students to gain knowledge on various insurance organizations.

UNIT – 1: INTRODUCTION TO BANKING (9Hr)

Meaning and functions of banking, importance of banking, Reserve Bank of India- Functions.

UNIT – 2: BANK-CUSTOMER RELATIONSHIP (9Hr)

Debtor-creditor relationship, deposit products or services, payment and collection of cheques. Accounts – Types of accounts, procedure for opening and closing an account. Loans and Advances- Principles of lending, Types of loans.

UNIT – 3: BUSINESS MODELS & ELECTRONIC PAYMENT SYSTEM (9Hr)

Features, types of e-payment system, e-cash, NEFT, RTGS, Credit cards, Electronic Wallet and Debit cards. Business models- B2B, B2C, C2C, and B2G.

UNIT - 4: **INTRODUCTION TO RISK AND INSURANCE (9Hr)**

Concept of risk, risk Vs uncertainty. Insurance definition, Insurance as risk mitigation mechanism, elements of insurance.

UNIT – 5: INSURANCE OVERVIEW (9Hr)

Principles of insurance, insurance types, LIC & GIC, insurance - functions, IRDA, Insurance Players in India.

Course Outcomes:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Demonstrate Knowledge in Tools and concepts of Banking .	PO11, PO12
CO2	Explain the operations and functions of banking towards customers	PO7, PO11
CO3	Apply skills in providing solutions for Online banking and e payment	PO7,PO11, PO12
CO4	Employ the risk management practices especially the insurance mechanism.	PO9,PO11
CO5	. Classify the various types of Insurance and understand the principles behind insurance	PO7, PO11

TEXT BOOKS:

1. A.V. Ranganadha Chary, R.R. Paul, *Banking and Financial system*, Kalyani Publisher, New Delhi, 2nd Edition.

2. P.K.Gupta, *Insurance and Risk Management*, Himalaya Publishing House, New Delhi.

REFERENCE BOOKS:

1. Diwan, Praq and Sunil Sharma, *Electronic Commerce- A Manager's Guide to E-Business*, Vanity Books International, Delhi, 2002.

2. Kalakota Ravi and Whinston Andrew B, *Frontiers of Electronic Commerce*, Pearson Education India, 1996 New Delhi.

3. Schneider, Grey P, *Electronic Commerce, Course Technology*, Cengage Learning, 8th Edition, New Delhi, 2008.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	-	-	-	-	-		-				2	2
CO.2	-	-	-	-	-		2				3	
CO.3	-	-	-	-	-		3				3	2
CO.4	-	-	-	-	-		-		2		3	
CO.5	-	-	-	-	-		2				3	
CO*	**-**	**-**	**-**	**-**	**-**		**2.33**		**2**		**2.8**	**2**

IV B. Tech I-Semester

L	T	P/D	C
3	**-**	**-**	**3**

18OSAH413 MANAGING INNOVATION AND ENTREPRENEURSHIP

(Open Elective-II)

Course Educational Objectives:

1.To enable students understand the importance of innovation in business practices
2. To enable students to innovate new methods and practices in business using innovation approaches
3. To provide knowledge on raising finance for starting new business
4. To enable students to protect their innovation through patent and copyright
5. To motivate students to become successful entrepreneurs through constant innovation

UNIT – 1: Creativity and Innovation (9Hr)

Introduction, Levels of Innovation, the Sources of Innovative Opportunity, The Innovation Process, Innovative Strategies, Creativity – Inbound, Outbound; Context and Process of New Product Development.

UNIT – 2: Paradigms of Innovation (9Hr)

Innovation in the Context of Developed Economies and Emerging Economies, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap

UNIT – 3: Intellectual Property Innovation and Entrepreneurship (9Hr)

Introduction to Entrepreneurship, Managerial and Entrepreneurial Competencies, Entrepreneurial Growth and Development, Intellectual Property – Forms of IP, Patents, Trademarks, Design Registration, Copy Rights, and Patent Process in India.

UNIT - 4: **Open Innovation Framework & Problem Solving (9Hr)**

Concept of Open Innovation Approach, Limitations and Opportunities of Open Innovation Framework, Global Context of Strategic Alliance, Problem Identification and Problem Solving, Innovation and Diversification

UNIT – 5: Sources of Finance and Venture Capital (9Hr)

Importance of Finance, Strategies of Venture Funding, Investment Process, Advantages and Disadvantages of Venture Capital, Venture Capital Developments in India

Course Outcomes:

	On successful completion of the course the student will be able to,	POs related to COs
CO1	Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures. .	PO9,PO11
CO2	Apply the approaches to innovation for developing successful ventures	PO9, PO11
CO3	Develop a comprehensive and well planned acquisition of finance for a new venture	PO9,PO10,PO11,
CO4	Exhibit entrepreneurial competencies and protect the innovations	PO9,PO11
CO5	Apply ethics in constructive innovation framework.	PO8, PO11,PO12

TEXT BOOKS:

1. Vinnie Jauhari, Sudhanshu Bhushan, InnovationManagement, Oxford University Press, 1st Edition, 2014.
2. Drucker, P. F., Innovation and Entrepreneurship, Taylor & Francis, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Robert D Hisrich, Claudine Kearney, Managing Innovation and Entrepreneurship, Sage Publications, 1st Edition, 2014.
2. V.K.Narayanan, Managing Technology and Innovation for Competitive Advantage, Pearson India, 1st Edition, 2002.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	-	-	-	-	-		-		2		3	
CO.2	-	-	-	-	-		-		2		3	
CO.3	-	-	-	-	-		-		2	3	3	
CO.4	-	-	-	-	-		-		2		3	
CO.5	-	-	-	-	-		-	3			3	2
CO*	**-**	**-**	**-**	**-**	**-**		**-**	**3**	**2**		**3**	**2**

IV B.Tech.I Sem

L	T	P/D	C
3	0	0	3

18OCSE411 FUNDAMENTALS OF DBMS(Open elective-II)

Course Educational Objectives:

1: Discuss the basic database concepts, applications, data models, schemas and instances and design Entity Relationship (E-R) model for a database.
2: Demonstrate the use of integrity constraints, relational algebra operations and relational calculus.
3: Describe the basics of SQL, construct queries using SQL, SQL functions, trigger and cursor concepts in PL/SQL.
4: Understand reasoning about functional dependency and to make the students to identify the role of normalization in database management systems.
5:To present the students with the knowledge of Transaction, concurrency and recovery strategies of DBMS.

UNIT 1Database Systems and Entity Relationship Modeling (8Hr)

Database System Applications - Purpose of Database Systems - View of Data - Database Languages - Database Users and Administrators - Database Architecture - The Entity-Relationship Model - Attributes and Entity Sets - Relationship Sets - Entity-Relationship Diagrams - Extended E-R Features.

UNIT 2 Relational Data Model (7 Hr)

Introduction to the Relational Model - Integrity Constraints - Fundamental Relational Algebra Operations - Tuple Relational Calculus - Domain Relational Calculus.

UNIT 3 Introduction to SQL (12 Hr)

Characteristics of SQL - advantages of SQL - SQL Data types and Literals.-Types of SQL Commands - SQL Operators and their Procedures - Form of Basic SQL Query - Examples of Basic SQL Queries - Relational Set Operators – SQL Join operators - Introduction to Nested Queries - Views - Indexes - SQL Functions - Database Triggers - Cursors in SQL – PL/SQL

UNIT 4 Normalization (9 Hr)

Introduction to Schema Refinement - Properties of Decompositions – Functional Dependencies - Reasoning about Functional Dependencies - Normal Forms - First - Second - Third – BCNF - MVD - Fourth Normal Form.

UNIT 5 Transaction Processing Concepts and Concurrency Control Techniques (9 Hr)

Transaction Concept - Transaction States - Implementation of Atomicity and Durability - Serializability - Recoverability - Concurrent Executions - Lock-Based Protocols for Concurrency Control - Time Stamp-Based Protocol for Concurrency Control - Multiple Granularity

Course Outcomes:

On successful completion of the course the student will be able to,

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on Data models and Database LanguagesandDesign Entity Relationship model for a database	PO1, PO3
CO2	Analyze the relational database theory, and be able to write relational algebra and relational calculus expressions for queries.	PO1, PO2
CO3	Analyze and evaluate the databases using SQL DML/DDL Commands	PO1, PO2, PO3, PO5
CO4	Analyze databases using normal forms to provide solutions for real time applications.	PO1, PO2
CO5	Understand the properties of transactions in a database system, Analyze concurrency control techniques for handling concurrent transactions and understand recovery of data from failures	PO1, PO3,PO4

TextBooks:

1. Database System Concepts, 6/e, 2006, Korth, Silberschatz, Sudarshan, Tata McGrawHill, New York.
2. Database Management System, 3/e, 2000,RaghuRamakrishnan, Tata McGrawHill, New York.

Reference Books:

1. Fundamentals of Database Systems, 5/e, 2008, Elmasri, Navathe, Pearson Education, USA.
2. *Database Management Systems* , 5/e, 2003, Peter Rob, A.*AnandaRao* and Carlos Coronel, Cengage Learning, USA.
3. SQL, PL/SQL Programming, 2/e, 2011, Ivan Bayross, BPB Publications, New Delhi, India.
4. Introduction to Database Systems, 8/e, 2004, C.J.Date, Pearson Education, USA.
5. Fundamentals of Database Management Systems, 1/e, 2006, M.L. Gillenson, Wiley, New Delhi, India.

IV.B.Tech.I Sem

L	T	P	C
3	0	0	3

180CSE412 BASICS OF INTERNET OF THINGS
(Open Elective-II)

Course Educational Objectives:

1: To understand the fundamentals of Internet of Things.
2: To learn about Building state of the art architecture in IoT.
3: To learn about basis of IOT protocols.
4: To build a small low cost embedded system using Raspberry Pi and ARDUINO,
5: To apply the concept of Internet of Things in the real world scenario.

UNIT I: Introduction ToIoT (10 Hr)

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IOT- IoT Protocols -Logical Design of IoT - IoT communication models - IoT Communication APIs - IoT enabled Technologies- Wireless Sensor Networks - Cloud Computing - Big data analytics - Communication protocols - Embedded Systems.

UNIT II: M2M and IoT Architecture (8 Hr)

The Vision - Introduction - From M2M to IoT. M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.

UNIT III: IoT Protocols(9)

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

UNIT IV: Building IotWith Raspberry Pi &Arduino (10 Hr)

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms – Arduino

UNIT V : Case Studies And Real-World Applications (9 Hr)

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

Course Outcomes:

After the successful completion of this course, the students should be able to:

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on fundamentals of Internet of Things and its functionalities.	PO1, PO2
CO2	Demonstrate knowledge on Building state of the art architecture in IoT.	PO1, PO2
CO3	Analyze various protocols for IoT	PO1, PO2,
CO4	Design a portable IoT using Rasperry Pi	PO1, PO2, PO3, PO4
CO5	Deploy an IoT application and connect to the cloud using Raspberry Pi & ARDUINO and apply the concept of Internet of Things in the real world scenario.	PO1, PO2, PO3, PO4, PO5

Text Books:

1. Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madisetti, 2015, Universities Press.
2. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, 2014, Academic Press.

References:

1. Internet of Things (A Hands-on-Approach), 1stEdition, Vijay Madisetti and ArshdeepBahga, 2014,VPT.
2. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Francis daCosta, Apress Publications, 2013
3. Architecting the Internet of Things, Bernd Scholz-Reiter, Florian Michahelles, ISBN 978- 3842-19156-5, Springer.
4. The Internet of Things Key Applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi, ISBN 978-1-119-99435-0, Wiley Publications.
5. The Internet of Things in the Cloud: A Middleware Perspective, HonboZhou , 2012, CRC Press .

IV.B.Tech.I .Sem

L	T	P	C
3	0	0	3

180CSE413 INFORMATION SECURITY

Course Educational Objectives:
The main objectives of this course are:

1: The course will incorporate the foundational understanding of Information Security.

2: The course will incorporate the threats and network perimeter security design principles and provide abilities to review procedures for installation, troubleshooting and monitoring of network devices to maintain integrity, confidentiality and availability of data and devices.

Unit-I Introduction: (9 Hr)

Security mindset, Computer Security Concepts (CIA), Threats, Attacks, and Assets

Unit-II Cryptographic Protocols: (8 Hr)

Introduction to Protocols, Communications using Symmetric Cryptography, Substitution Ciphers and Transposition Cipher, Block cipher, Stream cipher, Modes of operation, Symmetric and Asymmetric cryptography.

Unit-III Information Security Threats: (9 Hr)

Virus,Malware,DDoSattack,Trojan,Worm,Spyware,SocialEngineering, Phishing attacks, man-in-middle attack, DNS poisoning.

Unit –IV Proxy & Firewalls: (10 Hr)

WorkingofStatefulFirewall,TheConceptofState,StatefulFilteringandStateful Inspection, Fundamentals of Proxying, Pros and Cons of Proxy Firewalls, Types of Proxies, Tools forProxying.

Unit –V Network Intrusion Detection & Prevention Systems: (9 Hr)

Network Intrusion Detection Basics, the Roles of Network IDS in a Perimeter Defense,IDSSensorPlacement,IPS,IPSLimitations,NIPS,HostBasedIntrusion Prevention Systems, TrafficMonitoring.

Course Outcomes:

After the successful completion of this course, the students should be able to:		**POs related to COs**
CO1	Apply fundamental concepts of Information Security threats and vulnerabilities to adopt right security measures and design real time scenarios	PO1, PO2 , PO3
CO2	Implement, monitorandmaintainasecurenetworkconsistingofenterpriselevelroutersandswitches.	PO1, PO2, PO3
CO3	Design and implement AAA and IPSec and firewall technologies and design network policies to securing networks	PO1, PO2, PO3
CO4	Design/develop/ implement the security solution for a given application.	PO1, PO2, PO3, PO4
CO5	Detect the different types of intrusions	PO1, PO2, PO3, PO4, PO5

Text Books:

1. W. Stallings, Network Security Essentials (6th Edition), Prentice Hall.
2. W. R. Stevens, TCP/IP Illustrated, Vol. 1: TheProtocols,AddisonWesley 1993

References

1. D. E. Comer, Internetworking with TCP/IP, Vol.1 (4th Edition),Prentice Hall, 2000
2. R. Oppliger, Internet and Intranet Security (2nd edition), ArtechHouse, 2002
3. W.R.CheswickandS.M.Bellovin,FirewallsandInternetsecurity(2nd edition), Addison-Wesley, 2003

IV B.Tech I Semester **L T P C**

3 0 0 3

18OCIV411 TRANSPORT AND ENVIRONMENT(Open Elecive-II)

Course Educational Objectives:

1. The objective of this course is to create an awareness / overview of the impact of Transportation Projects on the environment and society.
2. To improve the environmental impact predictions
3. To study the water, air, land and noise assessment
4. To study the environmental mitigation.
5. To study the environmental case studies

UNIT 1: INTRODUCTION (9 Hr)

Environmental inventory, environmental assessment, environmental impact assessment (EIA), environmental impact of transportation projects, need for EIA, EIA guidelines fortransportation project, historical development.

UNIT 2: METHODOLOGIES (9 Hr)

Elements of EIA – Screening and scoping – Methods of impact analysis – Applications – appropriate methodology.

UNIT 3: ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT (9 Hr)

Prediction and assessment of impact of transportation project at various stages on water, air, noise, land acquisition and resettlement, socio economic impact, indigenous people, aesthetics, health and safety, energy studies, IRC guidelines.

UNIT 4: ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN (9 Hr)

Mitigation of the impact on natural and man-made environment, health, water, land, noise, air,public participation, environmental management plan, energy conservation, methods to reduce global warming.

UNIT 5: EIA CASE STUDIES (9 Hr)

EIA case studies on highway, railway, airways and waterways projects.

Total : 45 hours

Course Outcomes:

Upon completion of this course the student will be able to		**POs related to COs**
CO1	Explain the impact of transportation projects on the environment	PO1, PO2
CO2	Demonstrate the impact of environmental laws on transportation projects	PO1, PO2 ,
CO3	Demonstrate the impact of transportation project on the water, air, land and noise	PO1, PO2
CO4	Explain the environmental mitigation	PO1
CO5	Analyses the environmental case studies	PO1, PO2 ,

Text Books:

1. Environmental Impact Assessment, Canter, L.R., 1996, McGraw Hill, New Delhi.
2. Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, 1998, Delhi.
3. Elements of Environmental Science and Engineering, P. Meenakshi, 2006, Prentice Hall of India, New Delhi.
4. Introduction to Environmental Science and Management, Thirumurthy A.M., 2005, Shroff Publishers, Bombay.

Reference Books:

1. John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995.
2. James H.Banks, Introduction to Transportation Engineering, McGraw Hill Book Company, 2000.
3. A Handbook on Roads and Environment, World Bank, Vol.I and II, 1997, Washington DC.
4. International Encyclopedia of Ecology and Environment – EIA, Indian Institute of Ecology and Environment, PriyaRanjanTrivedi, 1998, New Delhi, Hyderabad: Indian Green Building Council.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	3				-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	2	2			-	-	-	-	-	-	-	-

IV B.Tech I Semester **L T P C**
3 0 0 3

18OCIV412 DISASTER MANAGEMENT(Open Elective-II)

Course Educational Objectives:

1. To explain disasters, their significance and types.
2. To demonstrate the disaster prevention and risk reduction methods.
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
4. To enhance awareness of institutional processes in the country.
5. To explain the disaster management case studies

UNIT 1: INTRODUCTION TO DISASTERS (9 Hr)

Definition: Disaster, hazard, vulnerability, resilience, risks – Disasters: types of disasters – Earthquake, landslide, flood, drought, fire etc – Classification, causes, impacts including social, economic, political, environmental, health, psychosocial, etc. – Differential impacts in terms of caste, class, gender, age, location, disability – Global trends in disasters: urban disasters, pandemics, complex emergencies, climate change – Dos and don'ts during various types of disasters.

UNIT 2: APPROACHES TO DISASTER RISK REDUCTION (DRR) (9 Hr)

Disaster cycle – Phases, culture of safety, prevention, mitigation and preparedness communitybased DRR, structural – Nonstructural measures, roles and responsibilities of community,panchayat raj institutions/urban local bodies (PRIs/ULBs), states, centre, and other stakeholders – Institutional processes and framework at state and central level – State disaster management authority (SDMA) – Early warning system – Advisories from appropriate agencies.

UNIT 3: INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT (9 Hr)

Factors affecting vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in land use etc. – Climate change adaptation – IPCC scenario and scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT 4: DISASTER RISK MANAGEMENT IN INDIA (9 Hr)

Hazard and vulnerability profile of India, components of disaster relief: water, food, sanitation, shelter, health, waste management, institutional arrangements (mitigation, response and preparedness, disaster management act and policy – Other related policies, plans, programmes and legislation – Role of GIS and information technology components in preparedness, risk assessment, response and recovery phases of disaster – Disaster damage assessment.

UNIT 5: DISASTER MANAGEMENT: APPLICATIONS, CASE STUDIES AND FIELDWORKS (9 Hr)

Landslide hazard zonation: case studies, earthquake vulnerability assessment of buildings and infrastructure: case studies, drought assessment: case studies, coastal flooding: storm surge assessment, floods: fluvial and pluvial flooding: case studies; forest fire: case studies, man-made disasters: case studies, space based inputs for disaster mitigation and management and field works related to disaster management.

Total : 45 hours

Course Outcomes:

Upon completion of this course the student will be able to		POs related to COs
CO1	Differentiate the types of disasters, causes and their impact on environment and society	PO1, PO2
CO2	Assess vulnerability and various methods of risk reduction measures as well as mitigation	PO1, PO2 ,
CO3	Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management	PO1, PO2
CO4	To analyse the disaster management techniques	PO1, PO2 ,PO3
CO5	To describe the situations of disaster management case studies	PO1, PO2 ,

Text Books:

1. Disaster Management, Singhal J.P. 2010, Laxmi Publications, ISBN-10: 9380386427; ISBN-13: 978-9380386423
2. Disaster Science and Management, Tushar Bhattacharya, 2012, McGraw Hill India Education Pvt. Ltd., ISBN-10: 1259007367, ISBN-13: 978-1259007361

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, 2005, New Delhi.
2. Government of India, National Disaster Management Policy, 2009.
3. Environmental Knowledge for Disaster Risk Management, NIDM, Gupta Anil K, Sreeja S. Nair. 2011, New Delhi.
4. Vulnerable India: A Geographical Study of Disasters, KapurAnu 2010, IIAS and Sage Publishers, New Delhi.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	-	-
CO2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	1	1	3	3	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	1.6	2.6	3	**3**	-	-	-	-	-	-	-	-

IV B.Tech I Semester

L	T	P	C
3	0	0	3

18OCIV413 AIR POLLUTION AND CONTROL ENGINEERING(Open Elective-II)

Course Educational Objectives:

1. To impart knowledge on the principle and design of control of indoor.
2. To study about meteorology.
3. To learn about particulate/ gaseous air pollutant and its emerging trends.
4. An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
5. Ability to identify, formulate and solve air and noise pollution problems

UNIT – 1: INTRODUCTION (9 Hr)

Structure and composition of atmosphere – Definition, scope and scales of air pollution –Sources and classification of air pollutants and their effect on human health, vegetation, animals,property, aesthetic value and visibility – Ambient air quality and emission standards – Ambient and stack sampling and analysis of particulate and gaseous pollutants.

UNIT – 2: METEOROLOGY (9 Hr)

Effects of meteorology on air pollution – Fundamentals, atmospheric stability, inversion, wind profiles and stack plume patterns – Atmospheric diffusion theories – Dispersion models, plume rise.

UNIT – 3: CONTROL OF PARTICULATE CONTAMINANTS (9 Hr)

Factors affecting selection of control equipment – Gas particle interaction – Working principle,design and performance equations of gravity separators, centrifugal separators fabric filters,particulate scrubbers, electrostatic precipitators – Operational considerations.

UNIT – 4: CONTROL OF GASEOUS CONTAMINANTS (9 Hr)

Factors affecting selection of control equipment – Working principle, design and performanceequations of absorption, adsorption, condensation, incineration, bio scrubbers, bio filters – Process control and monitoring – Operational considerations.

UNIT – 5: INDOOR AIR QUALITY MANAGEMENT (9 Hr)

Sources types and control of indoor air pollutants, sick building syndrome types – Radon pollution and its control – Sources and effects of noise pollution – Measurement – Standards– Control and preventive measures

Total : 45 hours

Course Outcomes:

Upon completion of this course the student will be able to		**POs related to Cos**
CO1	To impart knowledge on the principle and design of control of indoor.	PO1, PO2
CO2	To study about meteorology.	PO1, PO2
CO3	To learn about particulate/ gaseous air pollutant and its emerging trends.	PO1, PO2
CO4	An understanding of the nature and characteristics of air pollutants, noise pollution andbasic concepts of air quality management	PO1, PO2 ,PO3,PO4
CO5	Ability to identify, formulate and solve air and noise pollution problems	PO1, PO2 ,

Text Books:

1. Air Pollution Control Engineering, Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, 2004, Tokyo.
2. Air Pollution and Control Technologies, Anjaneyulu. Y, 2002, Allied Publishers (P) Ltd., India.

Reference Books:

1. Air Pollution, David H.F. Liu, Bela G. Liptak, 2000, Lweis Publishers.
2. Air Pollution (Vol.I – Vol.VIII), Arthur C.Stern, 2006, Academic Press.
3. Air Pollution Engineering Manual, Wayne T.Davis, 2000, John Wiley & Sons, Inc.
4. Air Pollution Control Engineering, Noel de Nevers, 1995, McGraw Hill, New York.

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	1	1	3	3	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	1.6	2.6	3	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

B.TECH IV-I SEM

L	T	P	C
3	0	0	3

18OEEE411 **WIND ENERGY CONVERSION SYSTEMS**

(Open Elective-II)

Course Educational Objectives:

On successful completion of the course, students will be able

1. To make the student know various methods of measuring wind speed and facilities available for storage of such data.

2. To train the students to design the blade of a wind turbines.

3. To make the student understand methods for sitting a wind farm.

4. To make the student understand economics of establishing wind system.

5. To make the student know the applications of wind turbine

. **Unit-I Introduction** **9 hours**

Modern wind turbines, wind resources, wind vs. traditional electricity generation, technology advancements, material Usage. Applications: grid connected power, industrial applications, stand-alone system, water pumping, offshore prospects Introduction of Wind Resource Assessment , spatial variation, time variations, seasonal and monthly variability, diurnal variations. Characteristics of steady wind: turbulence, types of turbulence models, turbulence intensity.

Unit -II Wind Measurement **9 hours**

Vertical profiles of the steady wind. Wind speed measurement parameters, Monitoring station instrumentation, cup anemometer, propeller anemometer, Ultrasound anemometer, wind vane, data loggers, remote wind speed sensing techniques- Sodar, Lidar, SAR, LWS, Satellite remote sensing, Aerofoil, two dimensional airfoil theory, relative wind velocity. Wind flow models, wind flow pattern. Axial momentum theory, Momentum theory, blade element theory. Wind machine characteristics.

Unit -III Wind Turbines **9 hours**

Historical development. Classification of wind turbines. Turbine components. Wind turbine design of Wind turbine, rotor torque and power, Power control, braking systems. Turbine blade design. Blade material, SERI blade sections. Transmission and generation efficiency, Energy production and capacity factor, Torque at constant speeds, Drive train oscillations.

Unit -IV Electrical and Control Systems **9 hours**

Introduction to electricity and magnetism. Classification of generators, AC circuits, Synchronous generators, Induction generators, Variable speed generators. Control systems. Power Collection system. Power quality,

wind farm and generation protection, interface protection, losses in generation. Asynchronous Load: Piston water pumps, Centrifugal pumps, Paddle wheel heaters, Batteries.

UNIT-V Wind Farm Design **9 hours**

Introduction, wind flow modeling, use of capacity factor for wind farm design, planning of wind farm. Siting of wind turbines, ecological indicators, layout of wind farm, initial site selection, micrositing, wake model. Economics of Wind Systems: Cost calculation, annual energy output, time value of money, capital recovery factor, depreciation. Cost of wind energy, present value of annual costs, value of wind generated electricity.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Able to Choose a method for measuring wind speed.	PO1,PO2,,PO3
CO2	Able to Identify ideal wind site for wind farm	PO1,PO2,PO3,PO4
CO3	Able to understand the Design the wind turbine	PO1,PO2,PO3
CO4	Able to Use the turbine for a particular application,	PO1,PO2,PO3
CO5	Capable to Start a wind turbine farm.	PO1,PO3,PO4

Text Books:

1. SirajAhmed:"Wind Energy-Theory and Practice" Second Edition, PHI Learning Pvt. Ltd, New Delhi, 2011.

Reference Books:

1. Garg L Johnson: "Wind Energy Systems" Prentice Hall. Inc, New Jersey, 1985

CO-PO Mapping:

PO **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	1	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	**1**								

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.TECH IV-I SEM

L	T	P	C
3	0	0	3

18OEEE412 **FUNDAMENTALS OF ENERGY AUDITING**

(Open Elective-II)

COURSE EDUCATIONAL OBJECTIVES:

On successful completion of the course, students will be able to

1: Learn about energy scenario
2: Learn about fundaments of Energy Auditing.
3: Learn about concept Energy Consumption.
4: Understand the Energy efficient motors and power factor improvement.
5: Know the concept Energy Measuring Instruments.

Unit I: Energy Scenario **9hours**

Primary and Secondary Energy, Conventional and non-conventional energy, Energy Security, Energy Conservation and its importance, Energy conservation Act., Thermal Energy basics, Energy Audit its definition & methodology.

Unit II: Fundamentals of Energy audit **9hours**

Energy Situation – World and India, Energy Audit Instruments, Benchmarking for energy performance, Energy Action Planning, Duties and responsibilities of Energy Manager; Energy financial management, Project Management, Energy monitoring and targeting, pinch technology.

Unit II: Energy Consumption **9hours**

Energy Consumption, Conservation, Codes, Standards and Legislation. Energy Audit- Definitions, Concept, Types of Audit, Energy Index, Cost Index, Pie Charts, Sankey Diagrams, Load Profiles, Energy Conservation Schemes. Measurements in Energy Audits, Presentation of Energy Audit Results.

Unit IV: Energy Efficient Motors and Power Factor Improvement **9hours**

Energy Efficient Motors , Factors Affecting Efficiency, Loss Distribution , Constructional Details , Characteristics - Variable Speed , Variable Duty Cycle Systems, RMS Hp-Voltage Variation-Voltage Unbalance- Over Motoring- Motor Energy Audit. Power Factor– Methods of Improvement, Power factor With Non Linear Loads

Unit V: Lighting and Energy Instruments For Audit **9hours**

Good Lighting System Design and Practice, Lighting Control, Lighting Energy Audit -Energy Instruments-Watt Meter, Data Loggers, Thermocouples, Pyrometers, Lux Meters, Tong Testers, Application of PLCs.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the concept basic energy scenario.	PO1, PO2.
CO2	Demonstrate knowledge on energy auditing and evaluate energy audit results.	PO1,PO2
CO3	Analyze demand side management concepts through case study	PO1,PO2
CO4	Acquire knowledge on motor energy audit.	PO1,PO2
CO5	Acquire knowledge on energy instruments.	PO1,PO2

Text Books:

1. Industrial Energy Management Systems, Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York, 1994.
2. Fundamentals of Energy Engineering - Albert Thumann, Prentice Hall Inc,Englewood Cliffs, New Jersey, 1984.

References:

1. Economic Analysis of Demand Side Programs and Projects – California Standard Practice Manual, June 2002 – Free download available online http://www.calmac.org/events/spm_9_20_02.pdf
2. Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann Publications, 2007.
3. Energy management by Paul o‟ Callaghan, Mc-graw Hill Book company-1st edition, 1998
4. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd- 2nd edition, 1995.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**2.8**	**2.6**										

B.TECH IV-I SEM

L	T	P	C
3	0	0	3

18OEEE413 INTRODUCTION TO POWER QUALITY

(Open Elective-II)

Course Educational Objectives:

On successful completion of the course, students will be able

1. To introduce the fundamental of electric power quality phenomena.
2. To make students learn the voltage variations.
3. To provide detailed analysis of Transients.
4. To make students learn about Harmonics.
5. To learn the power quality conditioners.

Unit-1: Introduction **10 hours**

What is power quality? Power quality – voltage quality - why are we concerned about power quality? - the power quality Evaluation procedure - Terms and Definitions - Transients - Long-duration voltage variations - short-voltage variations - voltage imbalance - wave form distortion - voltage fluctuation - power frequency variations - power quality terms CBEMA and ITI curves.

Unit -2: Voltage Sags and Interruptions **8 hours**

Sources of sags and interruptions - Estimating voltage sag performance - fundamental principles of protection - solutions at the end-use level - Motor-starting sags - utility system fault-clearing issues.

Unit -3: Transient Over Voltages **8hours**

Sources of over voltages - principles of over voltage protection - devices for over voltage protection - utility capacitor-switching transients - utility system lightning protection.

Unit -4: Fundamentals of Harmonics& Applied Harmonics **10hours**

Harmonic Distortion - Voltage versus current distortion - Harmonics versus Transients - power system qualities under non sinusoidal conditions - Harmonic indices - Harmonic sources from commercial loads - Harmonic sources from Industrial loads Effects of Harmonics - Harmonic distortion evaluations – Principles of Controlling Harmonics - Devices for Controlling Harmonic Distortion

Unit -V Power Quality Bench Marking and Monitoring **9hours**

Benchmarking process, Power Quality Contracts. Monitoring considerations - power quality measurement equipment, assessment of power quality measurement data, application of intelligent systems, - Power quality Monitoring standards.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Able to understand voltage sag, swell, long and short duration voltage variations.	PO1,PO2,,PO4,PO12
CO2	Able to understand the sources, principle of protection of voltage sag and interruption.	PO1,PO2,PO3,PO4,,PO12
CO3	Able to understand the concept of capacitor switching and lightning.	PO1,PO2,PO4,PO12
CO4	Able to understand the controlling of harmonic distortion.	PO1,PO2,PO3,PO4, ,PO12
CO5	Able to understand various power quality monitoring equipment and benchmarking process.	PO1,PO3,PO4,PO12

Text Books:

1. Electrical Power Systems Quality - Roger C. Dugan - Mark F. McGranaghan - Surya Santoso - H.Wayne Beaty - 2nd Edition - TMH Education Pvt. Ptd.

Reference Books:

1. Electrical systems quality Assessment by J. Arrillaga - N.R. Watson - S. Chen - John Wiley & Sons

2. Understanding Power quality problems by Math H. J. Bollen IEEE Press

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	3	-	-	-	-	-	-	-	3
CO2	2	2	3	3	-	-	-	-	-	-	-	3
CO3	2	2	-	3	-	-	-	-	-	-	-	3
CO4	2	2	3	3	-	-	-	-	-	-	-	3
CO5	2	-	3	3	-	-	-	-	-	-	-	3
CO*	**2**	**2**	**3**	**3**								**3**

IV B.Tech I Semester **L T P C**

3 0 0 3

18OMEC411 QUALITY CONTROL AND RELIABILITY ENGINEERING (Open Elective-II)

Course Educational Objectives:

1. To understand the concepts of quality, TQM, and statistical process control
2. To learn TQM principles and impact in continuous process improvement.
3. To study the online quality control system in an organization
4. To learn the concepts of offline quality control systems in an organization.
5. To study concepts of Reliability and Estimation

UNIT – 1: QUALITY CONCEPTS AND STATISTICAL PROCESS CONTROL (9 Hr)

Quality Concepts: Need for quality – Evolution of quality – Definition of quality – Dimensions of quality – Basic concepts and definition of TQM – Contributions of Deming, Juran and Crosby. **Statistical Process Control:** Inspection – Quality Control – Quality assurance – Customer orientation – Internal & External Customer – Life cycle Quality cost – The seven traditional tools of quality – New management tools

UNIT – 2: QUALITY PRINCIPLES AND TOOLS (9 Hr)

Leadership – Strategic quality planning – Quality statements – Customer focus, customer orientation, customer satisfaction, customer complaints and customer retention – Employee involvement – Motivation – Empowerment – Team and teamwork – Recognition and reward – Performance appraisal – Continuous process improvement – PDSA cycle, 5s, Kaizen – Supplier partnership – Partnering, supplier selection and supplier rating – Six-sigma concepts – Bench marking – TPM concepts.

UNIT– 3: ONLINE QUALITY CONTROL (9 Hr)

Control chart for attributes – Control chart for non-conforming – *p* chart and *np* chart – Control chart for nonconformities: C and U charts – Control chart for variables: X chart, R chart and σ chart – State of control and process out of control identification in charts – Pattern study – Process capability studies.

UNIT– 4: OFFLINE QUALITY CONTROL (9 Hr)

Lot by lot sampling – Types – Probability of acceptance in single, double, multiple sampling techniques – O.C. curves – Producers risk and consumers risk – AQL – LTPD – AOQL concepts – Standard sampling plans for AQL and LTPD – Uses of standard sampling plans.

UNIT – 5: RELIABLITY CONCEPTS AND ESTIMATION (9 Hr)

Reliability Concepts: Reliability engineering – Fundamentals – Failure data analysis – Mean failure rate, Mortality curves concept of burn in period – Useful life and wear out phase of a system – Mean time to failure – Meantime between failure – Hazard rate – Failure density and conditional reliability –

Maintainability and availability – simple problems. **Reliability Estimation:** Series, parallel and mixed configurations – Reliability improvement techniques – Use of pareto analysis – Design for reliability – redundancy unit and standby redundancy – Fault tree analysis – Optimization in reliability.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Illustrate the quality concepts of statistical process control, and contributions TQM Gurus in quality management	**PO1,PO11, PO12**
CO2	Recognize the quality principles and impact of 5s, Kaizen, PDSA cycles in continuous process improvement.	**PO1,PO11, PO12**
CO3	Demonstrate the basic need of online quality control and process control in an organization	**PO1,PO2, PO3, PO11, PO12**
CO4	Explain the basic need of offline quality control and process control in an organization	**PO1,PO2, PO3, PO11, PO12**
CO5	Realize the concepts of Reliability and Estimation	**PO1, PO2,PO11, PO12**

Text Books:

1. Quality Control, Besterfield D.H., 8/e, 2009, Pearson Education, India.
2. Reliability Engineering, E Balagurusamy, 2017, McGraw Hill India

Reference Books:

1. Introduction to Statistical Quality Control, Douglas.C. Montgomery, 7/e, 2013, John Wiley.
2. Statistical Methods for Quality, Reliability and Maintainability, K.Muralidharan and A Syamsundar, 2012, PHI Learning.
3. Statistical Quality Control, Monohar Mahajan, 2001, Dhanpat Rai &and Sons.
4. Reliability, Maintainability and Risk, David J Smith, 8/e, 2011, Butterworth-Heinemann, Elsevier Ltd.
5. Fundamentals of Quality Control and Improvement, Amitava Mitra, 4/e, 2016, JohnWiley&Sons,Inc.
6. Reliability Engineering, Kailash C. Kapur and Michael Pecht, 2014, John Wiley & Sons, Inc.

Codes/Tables: Use of approved statistical table permitted in the examination.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	1	2
CO.2	3	-	-	-	-	-	-	-	-	-	1	2
CO.3	3	2	1	-	-	-	-	-	-	-	1	2
CO.4	3	2	1	-	-	-	-	-	-	-	1	2
CO.5	3	2	-	-	-	-	-	-	-	-	1	2
CO*	**3**	**2**	**1**	-	-	-	-	-	-	-	**1**	**2**

IV B.Tech I Semester

L	T	P	C
3	0	0	3

18OMEC412 INDUSTRIAL ENGINEERING AND PSYCHOLOGY

Course Educational Objectives:

1. To learn the concepts of management and characteristics of personnel management and organization
2. To understand the organizational structures and plant layout for productivity improvements
3. To know the productivity, planning and control of a product
4. To discover the material handling techniques and Inventory control of manufacturing a product
5. To learn the industrial psychology and work study in an industry

UNIT – 1: CONCEPTS OF MANAGEMENT (9 Hr)

Management: Importance of administration and organization – Managerial skills, policies, goals and objectives – Scientific management – Contribution of FW Taylor, Henry Foyal and Gilberth – Principles, types, process, levels and functions of management – Management chart – Basic concepts in project management and MIS – Industrial ownership – Responsibilities of supervisor/foreman – Leadership concepts. **Personnel Management:** Recruitment, selection, training, job evaluation and merit rating – Wage plans and incentives – Welfare measures – Promotion, lay-off, transfer and discharge.

UNIT – 2: ORGANIZATIONAL STRUCTURES AND PLANT LAYOUT (9 Hr)

Organization: Concept, importance, characteristics, elements, and process of organization – Organization theory, principle, structure, chart and committees – Project, matrix and informal organization – Departmentation – Authority and delegation – Group dynamics – Organizational change, development and conflict – Managerial leadership and communication system. **Plant Layout:** Types – Flow pattern – Work station – Storage space – Layout procedure – Consideration in factory design.

UNIT – 3: PRODUCTION PLANNING AND CONTROL (9 Hr)

Productivity: Input output model – Factors affecting the productivity – Productivity resources and measures. **Production Planning:** Continuous and intermittent production – Job, open and closed job shop – One time large projects – Forecasting – Process planning – Economical batch quantity – Tool control – Control of production – Loading, scheduling, dispatching and routing – Progress and flow control.

UNIT – 4: MATERIALS MANAGEMENT AND INVENTORY CONTROL (9 Hr)

Materials Management: Concepts – Procurement – Purchase and order – Buying techniques. **Inventory Control:** Classification – Objectives – Functions – Economic order quantity (EOQ) – Inventory models – ABC analysis – Material requirements planning (MRP) – Manufacturing resource planning (MRP-II).

UNIT – 5: WORK STUDY AND INDUSTRIAL PSYCHOLOGY (9 Hr)

Work study: Ergonomics principles – Method study – Process chart symbols – Flow process and multiple activity chart – Flow and string diagram – Operation analysis – Analysis of motion – Design of work place – Therbligs – SIMO chart – Time study – Standard data – Analytical estimating – Performance rating – Allowances – PMTS. **Industrial Psychology:** Concept – Individual and group – Motivation theories – Hawthorne experiment – Morale and motivation – Working and environmental condition – Industrial fatigue.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the concepts of management and characteristics of personnel management and organization	**PO1, PO11, PO12**
CO2	Explain the organizational structures and plant layout for productivity improvements	**PO1,PO2, PO11, PO12**
CO3	Describe the productivity, planning and control of a product	**PO1,PO2, PO11, PO12**
CO4	Explain the material handling techniques and Inventory control of manufacturing a product	**PO1,PO2, PO11, PO12**
CO5	Demonstrate the industrial psychology and work study in an industry	**PO1,PO2, PO11, PO12**

Text books:

1. Industrial Engineering and Management, 17/e, 2010, O.P. Khanna, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Industrial Engineering and Management, Pravin Kumar, 1/e, 2015, Pearson Education, New Delhi.

Reference books:

1. Production and Operations Management, S. N. Chary, 6/e, 2019, Tata McGraw-Hill Education Pvt. Ltd., Noida.
2. Operations Management, William J Stevenson, 12/e, 2018, Tata McGraw-Hill Education Pvt. Ltd., Noida.
3. Production and Operations Management, Shailendra Kale, 1/e, 2013, Tata McGraw-Hill Education Pvt. Ltd., Noida.
4. Production and Operations Management, Kanishka Bedi, 3/e, 2013, Oxford University Press, India.
5. Manufacturing Organization and Management, 6/e, 2004, Harold T Amrine, John A Ritchey, Colin L Moodie and Joseph F Kmec, Pearson Education, New Delhi.
6. Industrial Engineering and Production Management, Martand T Telsang, 3/e, 2018, S.Chand Publications, New Delhi.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	1	1
CO2	2	2	-	-	-	-	-	-	-	-	1	1
CO3	2	2	-	-	-	-	-	-	-	-	1	1
CO4	2	2	-	-	-	-	-	-	-	-	1	1
CO5	2	2	-	-	-	-	-	-	-	-	1	1
CO*	**2**	2	-	-	-	-	-	-	-	-	1	1

IV B.Tech I Semester

L	T	P	C
3	0	0	3

18OMEC413 3D PRINTING AND DESIGN (Open Elective-II)

Course Educational Objectives:

1. To know the need and development of additive manufacturing technology.
2. To study the design for additive manufacturing and tool design
3. To recognize the parameters of photo polymerization and LOP
4. To explain powder bed fusion processes, binder and material jetting process
5. To know the post processes technique and applications of additive manufacturing process

UNIT – 1: OVERVIEW OF ADDITIVE MANUFACTURING (AM) (7 Hr)

Overview – Fundaments of Rapid Prototyping (RPT) – Additive V/s Conventional Manufacturing – Generic AM process – Development of AM technology – Use of layers – Classification of AM process – AM process chain – Basic steps for AM process – Differentiation between photopolymer system, powder based system, molten material system, solid sheets and metal system.

UNIT – 2: CAD MODELING AND DESIGN FOR ADDITIVE MANUFACTURING (11 Hr)

CAD Modeling: Preparation of CAD models – Data processing – STL format – Model slicing – Tool path generation – Data translation and loss – Customized design and fabrication for medical applications. **DFAM:** AM unique capabilities – DFAM concepts for complex geometry, integrated assemblies, customized geometry, multifunctional design and constraints – Part consolidation, redesign, structures and industrial applications – Light weight structure, optimization methods and topology. **Printing Processes:** Droplet formation technologies – Continuous mode – Drop on demand mode – Bioplotter.

UNIT – 3: LIQUID AND SOLID BASED ADDITIVE MANUFACTURING PROCESS (9 Hr)

Stereo lithography (SLA): Polymerization materials – Process – Patterns – Vat photo polymerization process – Benefits – Applications. **Fused Deposition Modeling (FDM**): Principle – Materials – Limitations – Benefits – Applications. **Laminated Object Manufacturing (LOM):** Bonding process – Adhesive bonding and thermal bonding – Materials – Limitation – Application.

UNIT – 4: POWDER BASED ADDITIVE MANUFACTURING PROCESS (9 Hr)

Selective Laser Sintering (SLS): Process – Materials – Powder fusion mechanism – Powder handling – Applications. **Selective Laser Melting (SLM) and Electron Beam Melting (EBM):** Principle – Materials – Process – Benefits – Applications. **Laser Engineered Net Shaping (LENS):** Materials – Material delivery – Process parameters – Benefits – Applications. **Binder Jetting:** Materials – Process – Benefits. **Material Jetting:** Materials – Process – Multijet modeling – Benefits.

UNIT – 5: POST PROCESSINGTECHNIQUES AND APPLICATIONS (9 Hr)

Product Quality: Material removal – Surface texture improvements – Accuracy improvements – Aesthetic improvements – Preparation for use of pattern – Property enhancement using thermal and non thermal techniques – Inspection and testing – Defects and their causes. **Applications:** Additive Manufacturing application of aerospace, electronics, healthcare, defense, automotive, construction, food processing, machine tool – Business opportunities and future directions of AM.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the need and development of additive manufacturing technology	**PO1, PO2, PO3**
CO2	Explain the design for additive manufacturing and tool design	**PO1, PO2, PO3**
CO3	Illustrate the parameters of photo polymerization and Laminated Object Manufacturing	**PO1, PO2, PO3, PO5**
CO4	Explain powder bed fusion processes, binder and material jetting process	**PO1, PO2, PO3, PO5**
CO5	Summarize the post processes technique and applications of additive manufacturing process	**PO1, PO2, PO3, PO5**

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing, Ian Gibson, David W.Rosen and Brent Stucker, 2/e, 2015, Springer.
2. Rapid Prototyping: Principles and Applications, Chee Kai Chua, Kah Fai Leong and Chu Sing Lim 3/e, 2010, World Scientific Publishers.

Reference Books:

1. Additive manufacturing: Innovations, Advances, and Applications, T.S. Srivatsan and T.S. Sudarshan, Taylor & Francis Group, LLC.
2. Additive Manufacturing of Emerging Materials, Bandar AlMangour, 2018, Springer.
3. 3D Printing and Additive Manufacturing Technologies, L. Jyothish Kumar, Pulak M. Pandey and David Ian Wimpenny, 2019, Springer Nature Singapore Pte Ltd.
4. 3D Printing: Technology, Applications, and Selection, Rafiq Noorani, 2018, CRC Press, Taylor & Francis Group.
5. Design for Additive Manufacturing, Martin Leary, 2019, Elsevier.
6. Additive Manufacturing Handbook: Product Development for the Defense Industry, Adedeji B. Badiru, Vhance V. Valencia, and David Liu, 2017, CRC Press, Taylor & Francis Group.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	2	-	-	-	-	-	-	-
CO4	3	2	1	-	2	-	-	-	-	-	-	-
CO5	3	2	1	-	2	-	-	-	-	-	-	-
CO*	**3**	**2**	**1**	-	**2**	-	-	-	-	-	-	-

IV Year B.Tech I semester	L	T	P	C
	0	0	2	1

18ECE416 MICROWAVE & OPTICAL COMMUNICATION LAB

COURSE EDUCATIONAL OBJECTIVES

CEO1: To provide the knowledge on the Microwave components and sources.
CEO2: To determine the characteristics of microwave and optical waveguides.
CEO3: To inculcate the skills regarding the measurement of VSWR, power, attenuation, Characteristics of various components, etc
CEO4: To determine the characteristics of LED and LASER.
CEO5: To Measure the losses of Analog and Digital link, and also NA.

Minimum twelve experiments to be conducted

Part-A

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics
3. Measurement of waveguide parameters.
4. Study of waveguide attenuator.
5. Study of Circulator/Isolator.
6. Study of Directional coupler and Extraction of S-parameter.
7. Study of E-plane, H-plane & Magic tee. Extraction of S-parameter.
8. Field intensity measurement of a Horn antenna.
9. Study of VSWR.

Part-B

1. Characteristics of LED.
2. Measurement of Numerical Aperture.
3. Characteristics of LASER Diode.
4. Intensity modulation of LASER output through an Optical fiber
5. Measurement of data rate for Digital optical Link
6. Measurement of losses for Analog optical link

Add-on Experiment

1. Study of Pulse width Modulation and demodulation.
2. Estimate the bandwidth of given fiber link.

COURSE OUTCOMES:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Understand the basics of waveguides, waveguide components, microwave & optical sources, etc.	PO1
CO2	Apply a proper waveguide component and it's ports to get required output signal	PO2
CO3	Analyze different waveguide components and microwave sources	PO3
CO4	Demonstrate different sources on different components for measuring purpose	PO4
CO5	Develop the measurement experiments with CW & AM modes	PO5
CO6	Follow ethical principles in designing and implementing various measuring circuits.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to microwave sources Optical fiber for various applications during their life time.	PO12

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	-	-	-	-	-	-	-	-	-	-	-
CO2	-	**3**	-	-	-	-	-	-	-	-	-	-
CO3	-	-	**3**	-	-	-	-	-	-	-	-	-
CO4	-	-	-	**3**	-	-	-	-	-	-	-	-
CO5	-	-	-	-	**3**	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	**3**	-	-	-	-
CO7	-	-	-	-	-	-	-	-	**3**	-	-	-
CO8	-	-	-	-	-	-	-	-	-	**3**	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	**3**

IV Year B.Tech I semester	L	T	P	C
	0	0	2	1

18ECE417 DIGITAL SIGNAL AND IMAGE PROCESSING LAB

Course Educational Objectives:

CEO1: Gain the practical knowledge on MATLAB tool usage

CEO2: To perform the image processing techniques like image transformation, enhancement, segmentation and compression techniques.

CEO3: To understand the filtering, color image processing concepts.

CEO4: To analyze the frequency response of low and high pass filters.

CEO5: To do the image smoothening and sharpening .

LIST OF EXPERIMENTS:

1. To study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
2. To verify Linear and Circular Convolution in CC studio.
3. To compute power density spectrum of a sequence in CC studio.
4. To Compute FFT of a signal in CC studio.
5. Introduction to MATLAB
6. MATLAB program to generate continuous and discrete signals, and sum of sinusoids.
7. MATLAB program to image manipulation and some conversions between different formats.
8. MATLAB program for image enhancement using point processing and gray level transformation.
9. MATLAB program for image segmentation using thresholding.
10. MATLAB program for image compression using BTC.
11. Image smoothening in spatial and frequency domain
12. Image sharpening in spatial and frequency domain

Add On Experiments:

1. MATLAB program for Homomorphic filtering.
2. MATLAB program for color image processing.
3. MATLAB program for image transforms using DCT.

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Perform image related operations and transforms on the given input image.	PO1
CO2	Apply a proper filter for a given set of noisy images	PO2
CO3	Analyze different image segmentation and compression techniques	PO3
CO4	Demonstrate different morphological operations.	PO4
CO5	Develop any application using different image processing techniques.	PO5
CO6	Follow ethical principles in designing, simulating and implementing various filter techniques	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to **CC** studio and MATLAB implementation for various application during their life time	PO12

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3

IV Year B.Tech II semester

L	T	P	C
2	1	0	3

18ECE421 SATELLITE & RADAR COMMUNICATIONS

Course Educational Objectives:

1. To provide knowledge on satellite orbits, launchers, subsystems, orbit mechanics and Placing a satellite in orbit.
2. To develop concepts of satellite links and calculation of satellite links budgets and Knowledge of different types of satellites and satellite services like VSAT, GPS etc.
3. To know the Fundamentals of Radar system.
4. To develop skill on Operation, applications, advantages of the CW Radar, FM CW Radar and Pulse Doppler radar.
5. To analyse the Concepts of Tracking Radar AND Detection of Radar signals

UNIT I: OVERVIEW OF SATELLITE, SUBSYSTEMS AND CONTROL (9Hr)

Introduction- Basic concepts of Satellite communications- Frequency allocations for satellite systems. Advantages and applications of satellite communications over other communications

ORBITAL ASPECTS AND CONTROL:

Orbital's- Mechanics- look angle determination- orbit perturbations- Orbital determination- launches and launch vehicles- orbital effects in communication systems performance- attitude and orbit control systems- Telemetry- tracking and command.

UNIT II: SATELLITE LINK DESIGN, EARTH STATION TECHNOLOGY AND APPLICATIONS (9Hr)

Basic transmission theory- - Design of down link and up link – Earth station design- equipment for Earth stations. INTELSAT Series- INSAT- VSAT- Non geostationary satellites-Mobile satellite services: GSM- GPS- INMARSAT.

UNIT III: BASICS OF RADAR AND RADAR EQUATION (9Hr)

Introduction - - Radar Block Diagram and Operation - Radar Frequencies and Applications - - Simple form of Radar Equation- Maximum Unambiguous Range- Prediction of Range Performance - Minimum Detectable Signal - Receiver Noise - Modified Radar Range Equation - System Losses - Illustrative Problems.

UNIT IV FM-CW AND PULSE DOPPLER RADAR (9Hr)

Doppler Effect - CW Radar – Block Diagram - Isolation between Transmitter and Receiver- Non-zero IF Receiver - Receiver Bandwidth Requirements - Applications of CW radar - FM-CW Radar- Range and Doppler Measurement- Block Diagram - FM-CW altimeter- MTI Radar with Power

Amplifier Transmitter and Power Oscillator Transmitter - Delay Line Cancellers - MTI versus Pulse Doppler radar.

UNIT V TRACKING RADAR And DETECTION OF RADAR SIGNALS (9Hr)

Tracking with Radar - Sequential Lobing - Conical Scan - Monopulse Tracking Radar –- Comparison of Trackers. - Introduction to Phased Array Antennas – Basic Concepts - Radiation Pattern - Beam Steering and Beam Width changes - Series versus Parallel Feeds - Applications - Advantages and Limitations.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Understand the concept of satellite orbits, launchers and subsystems	PO1, PO2,PO3
CO2	Demonstrate the design knowledge of satellites and its services	PO1, PO2, PO3,
CO3	Able to Identify the different blocks and its requirement in Radar System and develop the radar range equation	PO1, PO2, PO3,
CO4	Demonstrate the knowledge on different radars used for different applications	PO1, PO2, PO3
CO5	Acquire the design knowledge on different trackers and array antennas	PO1, PO2, PO3

TEXT BOOKS:

1. Satellite Communications, 2nd Edition, 2006, Timothy Pratt, Charles Bostian JeremyAllnutt, John willey india,New Delhi.
2. Introduction to Radar Systems, 2nd Edition, 2007, Merrill I. Skolnik, TMH Special Indian Edition.

REFERENCES:

1. Fundamentals of **Satellite** Communication, 1st Edition ,2006, K N Raja Rao, Prentice-Hall of india, New Delhi.
2. Satellite Communications, 1st Edition, 2009, V S Bagad, Technical publications, Pune.
3. Microwave and Radar Engineering, 2003, M. Kulakarni, Umesh Publications.
4. Understanding Radar Systems, 1992, Simon Kigsley, Tata Mc-Graw Hill, UK.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	3	-	-	-	-	-	-	-	-	-
CO*	3	2.6	2.4	-	-	-	-	-	-	-	-	-

IV Year B.Tech II semester

L	T	P	C
2	1	0	3

18ECE422 ARTIFICIAL INTELLIGENCE

Course Educational Objectives:

1. To study the concepts of Artificial Intelligence.
2. To Understand the search strategies and Problem solving using Artificial Intelligence.
3. To gain insight information about Logical Agents and Reasoning patterns in propositional logic
4. To study the Uncertain Knowledge and Reasoning
5. To study the Application of Robotics and predictive analytics using Rapid Miner

UNIT I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE, PROBLEMS, PROBLEM SPACES AND SEARCH (9Hr)

The AI Problems - The underlying assumption - The AI technique - The levels of the model - Criteria of success - Some general references - One final word and beyond - Defining the problem as a State space search - Production systems - Problem characteristics - Production system characteristics - Issues in the design of search programs

UNIT II: PROBLEM SOLVING, UN-INFORMED SEARCH STRATEGIES, INFORMED SEARCH AND EXPLORATION (9Hr)

Uninformed search strategies - Avoiding repeated states - Informed (Heuristic) search strategies - Heuristic functions - Local search algorithms and optimization problems - Local search in continuous spaces - Backtracking search for CSPs

UNIT III: KNOWLEDGE AND REASONING (9Hr)

Logical agents – Knowledge based agents - The wumpus world – Logic - Propositional logic - a very simple logic - Reasoning patterns in propositional logic - Effective propositional inference - Agents based on propositional logic

UNIT IV: UNCERTAIN KNOWLEDGE AND REASONING, LEARNING (9Hr)

Uncertainty - Acting under uncertainty - Baye's rule and its use - Learning from observations - Forms of learning - Inductive learning - Learning decision trees

UNIT V: ROBOTICS AND PREDICTIVE ANALYTICS (9Hr)

Robotics: Introduction-Robot hardware - Robotic perception - Planning to move-Robotic software Architectures - Application Domains
Case Study1**:** Medical Data Analysis using Rapid Miner Tool
Case Study2: Agriculture Data Analysis using Rapid Miner Tool

Total Hours (45Hr)

COURSE OUTCOMES:

On Successful completion of this course the students will be able to		POs related to COs
CO1	Gain the basic Knowledge about AI technique and Production systems	PO1
CO2	Comprehend the Un informed and Informed Search Strategies.	PO1, PO2,PO3
CO3	Analyze and Implement Reasoning patterns in propositional logic	PO1, PO2
CO4	Formulate the Knowledge and Reasoning techniques in solving problems	PO1, PO2,PO4
CO5	Apply Robotics to Solve Real world Problems and use rapid miner applications	PO1, PO2, PO4, PO9

TEXT BOOKS:

1. Artificial Intelligence A Modern Approach, 2/e, Stuart Russell and Peter Norvig, 2003, Pearson Education, New Delhi, India.
2. Artificial Intelligence, 3/e, Elaine Rich, Kevin Knight and Shiva Shankar B Nair, 2004, Tata McGraw Hill, Hyderabad, India.

REFERENCE BOOKS:

1. Artificial Intelligence Structures and Strategies for Complex Problem Solving, 5/e, George F. Luther, 2005, Pearson Education, New Delhi, India.
2. Introduction to Artificial Intelligence, 1/e, Eugene Charniak and Drew McDermott, 1985,Pearson Education, New Delhi, India.
3. Artificial Intelligence: The Basics, 1/e, Kevin Warwick, 2012, Wearset ltd, Boldon.
4. Introduction to Artificial Intelligence, 2/e, Philip C. Jackson, 1985, Dover Publications, New York, USA.
5. Our Final Invention: Artificial Intelligence and the End of the Human Era, 1/e, James Barrat, 2013,Thomas Dunne Books, New York, USA.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	2	-	-	-	-	-	-	-	-
CO5	2	2	-	2	-	-	-	-	1	-	-	-
CO*	2.4	2.25	3	2	-	-	-	-	1	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	1	0	3

18ECE423A ADVANCED COMPUTER ARCHITECTURE (Core Elective - III)

Course Educational Objectives:

1. Understand the micro-architectural design of processors
2. Learn about the various techniques used to obtain performance improvement and power Savings in current processors
3. To gain knowledge in memory organization
4. To inculcate the paradigm of the multiprocessor with associated issues
5. Analysis and understand the various advanced processing technology and its future Endurances.

UNIT 1: FUNDAMENTALS OF COMPUTER DESIGN (9Hr)

Introduction, The task of a Computer Designer, Technology and Computer Usage Trends, Cost ad Trends in Cost, Measuring and reporting performance, Quantitative principles of computer design, Control Units: Hardwired And Micro Programmed Design Concept, Microprogramming, Bus architectures: Uni-bus and multi-bus architectures.

UNIT 2: PARALLEL COMPUTER MODELS AND INSTRUCTION LEVEL PARALLELISM (9Hr)

The state of computing, Classification of parallel computers, Multiprocessors and multicomputer, Multifactor and SIMD computers, Instruction Level Parallelism, Overcoming Data Hazards with Dynamic Scheduling, Reducing Branch Penalties with Dynamic , Hardware
Support for Extracting More Parallelism.

UNIT 3: MEMORY HIERARCHY DESIGN (9Hr)

Introduction, The Fundamentals of Caches, Reducing Cache Misses, Reducing Cache Miss Penalty, Reducing Hit Time, Main Memory, Virtual Memory, Issues in the Design of Memory Hierarchy.

UNIT 4: MULTIPROCESSORS (9Hr)

Introduction, Characteristics of Application Domains, Centralized Shared Memory Architectures, Distributed Shared Memory Architectures, Synchronization, Models of Memory Consistency, Crosscutting Issues.

UNIT 5: ADVANCED PROCESSORS (9Hr)

Advanced processor technology-CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures

Total Hours (45Hr)

Course Outcomes:

Course Outcomes		POs related to COs
CO1	Evaluate performance of different architectures with respect to various parameters	PO1, PO2,PO9
CO2	Analyze performance of different ILP techniques	PO1, PO2, PO3
CO3	Identify cache and memory related issues in multi-processors	PO1, PO2,PO3
CO4	To develop skills in multiprocessors and multiprogramming.	PO1, PO2,PO4,PO3
CO5	To gain Knowledge of processing elements superscalar's VLIW architectures	PO1,PO2,PO5,PO9

TEXT BOOKS:

1. Kai Hwang, "Advanced computer architecture", Tata-Mc. Graw Hill Publishers, 2000.
1. J.P.Hayes, "computer Architecture and organization", Mc-Graw Hill
2.

REFERENCE BOOKS:

1. D. A. Patterson and J. L. Hennessey, "Computer organization and design," Morgan Kaufmann, 2nd Ed.
2. Harvey G.Cragon,"Memory System and Pipelined processors"; Narosa Publication.
3. R.K.Ghose, RajanMoona&Phalguni Gupta, "Foundation of Parallel Processing"; Narosa Publications.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	2	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-
CO5	3	2	-	-	2	-	-	-	3	-	-	-
CO*	2.8	2.6	2.3	3	2	-	-	-	2.5	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE423B PATTERN RECOGNITION (Core Elective - III)

Course Educational Objectives:

1. To provide knowledge on Basics Pattern Recognition.
2. To acquire knowledge on various methods of statistical Pattern Recognition.
3. To be able to solve dimensionality problem.
4. To understand the linear discriminant functions and neural network classifier.
5. To gain the principle of time varying pattern recognition and unsupervised classification.

PREREQUISITE:

18ECE223- Probability Theory and Stochastic Process, 18ECE212-Signals and Systems, 18ECE323-Digital Signal Processing.

UNIT - 1: INTRODUCTION TO PATTERN RECOGNITION (9Hr)

Linear Discriminant, Multiple Discriminant Analysis World, **Introduction:** Feature extraction and Pattern Representation Concept of Supervised and Unsupervised classification Introduction to Application Areas.

UNIT – 2: STATISTICAL PATTERN RECOGNITION (9Hr)

Bayes Decision Theory, Minimum Error and Minimum Risk Classifiers, Discriminant Function and Decision Boundary Normal Density, Discriminant Function, Discrete Features, Parameter estimation.

UNIT - 3: DIMENSIONALITY PROBLEM (9Hr)

Dimension and accuracy, Computational Complexity, Dimensionality Reduction, Fisher Density Estimation, Nearest Neighbor Rule, Fuzzy Classification.

UNIT - 4: LINEAR DISCRIMINANT FUNCTIONS (9Hr)

Separability, Two Category and Multi Category Classification, Linear Discriminators, Perceptron Criterion, Relaxation Procedure, Minimum Square Error Criterion, Widrow-Hoff Procedure, Ho-Kashyap Procedure, Kesler‟s Construction.

NEURAL NETWORK CLASSIFIER:

Single and Multilayer Perceptron, Back Propagation Learning, Hopfield Network, Fuzzy Neural Network.

UNIT – 5: TIME VARYING PATTERN RECOGNITION: (9Hr)

First Order Hidden Markov Model, Evaluation, Decoding, Learning.

UNSUPERVISED CLASSIFICATION:

Clustering, Hierarchical Clustering, Graph Based Method, Sum of Squared Error Technique Iterative Optimization.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on Basics of pattern recognition and analysis of unsupervised classification with application areas.	PO1, PO2
CO2	Demonstrate the knowledge on statistical pattern recognition with analytical skills.	PO1, PO2,PO4
CO3	Ability to understand the dimensionality problem.	PO1, PO2,PO4
CO4	Acquire the basic knowledge on linear discriminant function and neural network classifier.	PO1, PO2
CO5	Understand the need for and use of time varying pattern recognition and unsupervised classification.	PO1, PO2,PO4

TEXT BOOKS:

1. Robert J.Schalkoff, Pattern Recognition Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 1992.
2. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.

REFERENCES:

1. Duda R.O., and Har P.E., Pattern Classification and Scene Analysis, Wiley, New York, 1973.
2. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, New York, 1993.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	1	-	-	-	-	-	-	-	-
CO*	3	2.6	-	1.67	-	-	-	-	-	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE423C RF INTEGRATED CIRCUITS (Core Elective - III)

Course Educational Objectives:

1. To understand the basics of RF Systems and various matching networks and components.
2. To acquire the knowledge on MOS devices characteristics.
3. To study the various noises in RFIC.
4. Analyse the design of different RF Power Amplifiers circuits.
5. Acquire the knowledge on Frequency synthesis and oscillators.

UNIT – I INTRODUCTION RF SYSTEMS (9Hr)

Basic architectures, Transmission media and reflections, Maximum power transfer , Passive RLC Networks, Parallel RLC tank, Q, Series RLC networks, matching, Pi match, T match, Passive IC Components Interconnects and skin effect, Resistors, capacitors Inductors

UNIT – II REVIEW OF MOS DEVICE PHYSICS (9Hr)

MOS device review, Distributed Systems, Transmission lines, reflection coefficient, the wave equation, examples, Lossy transmission lines, Smith charts – plotting Gamma, High Frequency Amplifier Design, Bandwidth estimation using open-circuit time constants, Bandwidth estimation, using short-circuit time constants, Rise time, delay and bandwidth, Zeros to enhance bandwidth, Shunt-series amplifiers, tuned amplifiers, Cascaded amplifiers

UNIT - III NOISE (9Hr)

Thermal noise, flicker noise review, Noise figure, LNA Design, Intrinsic MOS noise parameters, Power match versus, noise match, large signal performance, design examples & Multiplier based mixers. Mixer Design, Sub sampling mixers.

UNIT – IV RF POWER AMPLIFIERS (9Hr)

Class A, AB, B, C amplifiers, Class D, E, F amplifiers, RF Power amplifier design examples, Voltage controlled oscillators, Resonators, Negative resistance oscillators, Phase locked loops, Linearized PLL models, Phase detectors, charge pumps, Loop filters, and PLL design examples.

UNIT – V RADIO Architecture (9Hr)

Frequency synthesis and oscillators, Frequency division, integer-N synthesis, Fractional frequency, synthesis, Phase noise, General considerations, and Circuit examples, Radio architectures, GSM radio architectures, CDMA, UMTS radio architectures

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to,

Course Outcomes		POs related to COs
CO1	Design various passive networks.	P01, PO2, PO3
CO2	Design the different MOS device amplifiers.	P01, P02,PO3
CO3	Analyze the different types of noises present in RFIC.	P01, P02
CO4	Analyze and Design RF power amplifier circuits.	P01, P02,PO3
CO5	Have knowledge by analyzing different radio architectures.	P01, P02

TEXT BOOKS:

1. The design of CMOS Radio frequency integrated circuits by Thomas H. Lee Cambridge university press, 2004.
2. RF Micro Electronics by BehzadRazavi, Prentice Hall, 1997.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	2.2	2	-	-	-	-	-	-	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE423D CYBER SECURITY (Core Elective - III)

Course Educational Objectives:

1. To understand the OSI architecture by different services and mechanisms
2. To Provide the student to learn various block cipher and stream cipher using different algorithms.
3. Analyze the depth learning of finite fields and number theory also learn the cryptography
4. Describe the principles of public key cryptosystems, hash functions and digital signature.
5. To Secure the network and studying about the layers by different concepts

UNIT - 1: BASIC PRINCIPLES (9Hr)

Introduction to Cryptography, types and techniques, Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT - 2: SYMMETRIC ENCRYPTION (9Hr)

Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard. RSA algorithm.

UNIT - 3: ASYMMETRIC ENCRYPTION (9Hr)

Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography- RSA Cryptosystem, Rabin Cryptosystem, ElGamal Cryptosystem, Elliptic Curve Cryptosystem.

UNIT - 4: DATA INTEGRITY, DIGITAL SIGNATURE SCHEMES & KEY MANAGEMENT (9Hr)

Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT - 5: NETWORK SECURITY (9Hr)

Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS- SSL Architecture, Message formats and transport layer security, Security at the Network Layer: IPSec- Security Association and policy, Internet key exchange, System Security-Buffer Overflow and Malcious Software, Malicious programs, Intrusion Detection Systems.

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to,		**P0s related to COs**
C01	Understanding the types and techniques of Cryptography also achieve the Security Goals	P01, P02, P03
C02	Different types of symmetric advanced standards and algorithms are learned	P01, P02, P03
C03	Primality testing done by a Asymmetric Key Cryptography	P01, P02,P03,P04
C04	Design Secure applications like Digital Signature and Hash Functions	PO1,P02,P03, P04
C05	Different types of Security coding and applications are learned	P01, P02, P03, P04

TEXT BOOKS:

1. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, (3e) Mc Graw Hill.
2. Cryptography and Network Security, William Stallings, (6e) Pearson.
3. Everyday Cryptography, Keith M.Martin, Oxford.

REFERENCES:

1. Network Security and Cryptography, Bernard Meneges, Cengage Learning

CO-PO Mapping

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO*	2.8	3	2.2	2	-	-	-	-	-	-	-	-

IV B.Tech II Semester	L	T	P	C
	3	0	0	3

18ECE423E MULTIMEDIA COMPRESSION AND NETWORK (Core Elective - III)

Course Educational Objectives:

1. Gain fundamental knowledge in understanding the basics of different multimedia networks and applications
2. Analyze compression techniques required to compress text and image
3. Analyze compression techniques required to compress audio and video
4. . Gain fundamental knowledge about multimedia communication across different networks.
5. Gain fundamental knowledge about communication protocols for multimedia networking

UNIT 1: MULTIMEDIA COMMUNICATIONS (9Hr)

Introduction, Multimedia Communication, Multimedia Network, Communications Standards, Technological Advancement and Challenges, Basics multimedia information representation, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS, application QoS.

UNIT 2: TEXT AND IMAGE COMPRESSION (9Hr)

Introduction, digital principles, text, images, audio, video.,compression principles, text compression, image compression.

UNIT3: AUDIO AND VIDEO COMPRESSION (9Hr)

Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles : H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

UNIT– 4: MULTIMEDIA INFORMATION NETWORKS (9Hr)

Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol. THE INTERNET**:** Introduction, IP Datagrams, Fragmentation, IPAddress, ARP and RARP, QoS Support, IPv8.

UNIT 5: MULTIMEDIA COMMUNICATION ACROSS NETWORKS: (9Hr)

Packet audio/video in the network environment, Video transport across generic networks, Multimedia Transport across ATM Networks

Total Hours (45Hr)

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Understand basics of different multimedia networks and applications.	**PO1,PO2**
CO2	Analyze different compression techniques to compress text and images.	**PO1,PO2,PO3**
CO3	Understand different compression techniques to compress audio and video.	**PO1,PO2**
CO4	Describe multimedia multimedia information networks	**PO1,PO2**
CO5	Provide knowledge on multimedia Communication across Networks	**PO1,PO2**

TEXT BOOKS

1. Multimedia Communications: Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCES

1. Multimedia Information Networking , Nalin K. Sharda, PHI, 2003.
2. Multimedia Fundamentals: Vol 1- Media Coding and Content Processing, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. Multimedia Systems Design, Prabhat K. Andleigh, Kiran Thakrar, PHI,2004.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO*	2.6	2.2	2	-	-	-	-	-	-	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE424A EMBEDDED REAL TIME OPERATING SYSTEMS (Core Elective - IV)

Course Educational Objectives:

1. To understand the basics of an embedded system with developed applications
2. To design different types of devices using advanced techniques
3. Students will learn different types of programming models and knowledge in Embedded C.
4. To understand operating systems concepts, types and choosing RTOS.
5. To design and implement and test an embedded system.

UNIT - 1: INTRODUCTION (9Hr)

Embedded System-Definition, History, Classification, application areas and purpose of embedded systems, Block diagram of embedded system, Quality attributes of an Embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT - 2: EMBEDDED HARDWARE DESIGN (9Hr)

Review of Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT - 3: EMBEDDED FIRMWARE DESIGN (9Hr)

Embedded Firmware design approaches, Embedded Firmware development languages, Program Models, DFG Models, state Machine Programming Models for Event-controlled Program Flow, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT - 4: REAL-TIME OPERATING SYSTEMS (RTOS): (9Hr)

Operating System Basics- Types of Operating Systems- Tasks- Process and Threads-Multiprocessing and Multitasking- Task Scheduling- Threads- Processes and Scheduling:Putting them Altogether- Task Communication- Task Synchronization- Device Drivers- How to Choose an RTOS.

UNIT - 5: DESIGN EXAMPLES AND CASE STUDIES (9Hr)

Case study of Communication between Orchestra Robots, Embedded Systems in Automobile, Case study of an Embedded System for an Adaptive Cruise Control(ACC) System in a Car, Case study of an Embedded System for a Smart Card, Introduction to AVR family of microcontrollers.(ATmega8).

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	Understand and Design of Embedded systems	PO1, PO2
CO2	Learn different types advanced devices	PO1, PO2, PO3
CO3	To Understand embedded firmware design efficient approaches	PO1, PO2,PO3
CO4	Learn basic OS and RTOS	PO1, PO2,PO4
CO5	Knowledge types of memory and interacting to external world.	PO1,PO2

TEXT BOOKS:

1. Introduction to Embedded System, ShibuKV ,2/e, Tata McGraw Hill. New Delhi. 2003.
2. Embedded system architecture, programming and design,sixthreprint, Rajkamal, Tata McGraw Hill. New Delhi. 2005

REFERENCE BOOKS:

1. Micro Controllers(theory and applications), Ajay V Deshmukh ,1/e, Tata McGraw Hill.New Delhi, 2005.
2. An Embedded Software Primer, David E. Simon,1/e Pearson Education private limited,NewDelhi, 2007
3. Microcontrollers architecture, programming and design, Raj kamal,1/e, Pearson Education,NewDelhi. 2007.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley 1/e, Tata McGraw Hill. New Delhi. 2000.
5. The 8051 microcontroller and embedded systems, Muhammad alimazdi, Janice GillispieMazidi 1/e, pearson private limited, New Delhi. 2002.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	-	2	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	2.5	2	-	-	-	-	-	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE424B ARTIFICIAL NEURAL NETWORK (Core Elective - IV)

Course Educational Objectives:

1. To provide in depth knowledge on the Neural network fundamentals.
2. To introduce the various learning rules of Neural Networks both supervised and unsupervised.
3. To explain the working of error back propagation training algorithm and its use as a mathematical tool for solving problems.
4. To understand the biological neural network and to model equivalent neuron models
5. To apply Neural networks to practical problems and to find solutions

UNIT 1: INTRODUCTION TO ARTIFICIAL NEURAL NETWORK (9Hr)

Introduction: AI problems, Foundation of AI, Agents and Environments, the concept of rationality, structure of agents, Models of neuron, Topology, characteristics of artificial neural networks, types of activation functions, Problem solving, Problem formulation.

UNIT 2: SEARCHING AND SORTING (9Hr)

Searching: searching for solutions, uniformed search strategies, Breadth first search, depth first search, search with partial information (Heuristic search), Greedy best first search, Adversial search in game playing: Games, minimax, optimal decisions in multiplayer games, Alpha-beta pruning, Evaluation functions.

UNIT 3: KNOWLEDGE REPRESENTATION AND LEARNING LAWS (9Hr)

Knowledge representation & reasons logical agents, Knowledge based agents, Wumpus world logic, Propositional logic, Resolution parameters in proportional logic, resolution, Forward and Backward, Chaining.

UNIT 4: FEED FORWARD AND RECURRENT NEURAL NETWORKS (9Hr)

Feed forward neural networks:

Introduction, Analysis of Pattern association networks, Analysis of pattern classification networks, Analysis of pattern mapping networks, Feed-back neural networks.

Recurrent Neural networks:

Linear auto associator, Bi-directional associative memory, Hopfield neural network, Travelling Salesman Problem.

UNIT 5: UNSUPERVISED LEARNING (9Hr)

Competitive learning neural networks – Max net – Mexican Hat – Hamming net.
Applications of neural networks in image processing, signal processing, modelling and control.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to		POs related to COs
CO1	An ability to apply knowledge of mathematics, science, and engineering.	PO1, PO2
CO2	Perform the testing of neural networks and do the perform analysis of the networks for pattern analyzing applications	P01,PO2,PO4
CO3	Learning basic laws towards network algorithms	PO1, PO2
CO4	Understand the difference in network architecture and an ability to design networks.	PO1,PO2,PO3
CO5	Perform the testing and training of neural networks using learning rules	PO1,PO2

TEXT BOOKS:

1. Artificial Intelligence-A modern approach. Second edition, Stuart Russel, Peter Norvig, PHI/Pearson Education.
2. Artificial Neural Networks B.YagnaNarayana, PHI

REFERENCES:

1. Artificial intelligence, 2nd edition, E.rich and K.Knight(TMH).
2. Artificial intelligence and expert systems – Patterson PHI.
3. Expert systems: Principles and Programming- Fourth Edn, Giarrantanal/Riley, Thomson.
4. PROLOG Programming for artificial intelligence. Ivan Brakta-Third edition- pearson education.
5. Neural networks Simon Haykin PHI
6. Artificial intelligence, 3rd edition, Patrick henry Winston,Pearson edition.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	2	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	2.6	2.2	2	2	-	-	-	-	-	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE424C BIO-MEDICAL INSTRUMENTATION (Core Elective -IV)

Course Educational Objectives:

1. To provide an overview of medical instrumentation system, Bio-amplifier and Characteristics of medical instruments.
2. To Describe the Cell structure**,** Bio-Potential and Bio-Chemical electrodes.
3. To analyze different time base generators used in cardiac instrumentation.
4. To know the functions of ECG,EEG and EMG machines.
5. To understand and analyze Pacemaker, Defibrillator etc in Respiratory Instrumentation And Advanced 3D surgical techniques.

UNIT - 1: MEDICAL INSTRUMENTATION SYSTEM (9Hr)

Block diagram of medical instrumentation system, Bio-amplifier, Static and dynamic characteristics of medical instruments, Bio-signals and characteristics. Problems encountered with measurements from human beings.

UNIT - 2: ORGANISATION OF CELL & BIO-ELECTRODES (9Hr)

Cell structure, Nernst equation for membrane Resting Potential , Generation and Propagation of Action Potential ,Conduction through nerve to neuro muscular junction. Bio-Electrodes: Bio-Potential electrodes, External electrodes, Internal electrodes, Bio-chemical electrodes.

UNIT - 3: MECHANICAL FUNCTION OF CARDIAC INSTRUMENTATION (9Hr)

General features of a time base signal- methods of generating time base waveform- Miller and Bootstrap time base generators - basic principles- Transistor miller time base generator- Transistor Bootstrap time base generator- Current time base generators.

UNIT - 4: NEURO-MUSCULAR INSTRUMENTATION (9Hr)

EEG and EMG machines, Specifications of EEG and EMG machines, Electrode placement for EEG and EMG

UNIT - 5: THERAPEUTIC EQUIPMENT & RESPIRATORY INSTRUMENTATION AND ROBOTIC DEVICES (9Hr)

Heart-Lung Machine, Pacemaker, Defibrillator ,Shortwave diathermy, Hemadialysis machine, Mechanism of respiration,Spirometry,Pneumatotachograph,Ventillators- Nano Robots -Robotic surgery – Advanced 3D surgical techniques

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to		**POs related to COs**
CO1	Understand medical instrumentation system, Bio-amplifier and characteristics of medical instruments.	PO1,PO2
CO2	Describes the Cell structure**,** Bio-Potential electrodes and Bio-Chemical electrodes.	PO1,PO2,PO5
CO3	Analyze the various parts in time base generators used in cardiac instrumentation.	PO1,PO2, PO5
CO4	Know the functions of ECG, EEG and EMG machines.	PO1,PO2, PO5
CO5	Understand and analyze Pacemaker, Defibrillator etc in Respiratory Instrumentation and Advanced 3D surgical techniques.	PO1,PO2, PO5

TEXT BOOKS :

1. Bio Medical Instrumentation and Measurements – 2nd Edition ,2002, Leslie Cromwell, Fred J.Weibell Erich A.Pfeiffer , Pearson Education , New Delhi
2. Handbook of Bio Medical instrumentation - 3rd edition ,2003,R.S.Khandpur,Tata McGraw Hill Publishing Co Ltd , New Delhi.

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REFERENCES:

1. Medical Instrumentation -1st edition ,1995 ,J.Webster ,John Wiley & Sons, London
2. Principles of Medical Electronics and Bio medical Instrumentation - 2nd Edition , 2000, C.Rajarao and S.K. Guha, Universities press (India) Ltd, Orient Longman ltd , India.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	3	3	-	-	2	-	-	-	-	-	-	-
CO4	3	3	-	-	2	-	-	-	-	-	-	-
CO5	3	3	-	-	2	-	-	-	-	-	-	-
CO*	3	3	-	-	2	-	-	-	-	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE424D LOW POWER VLSI DESIGN (Core Elective IV)

Course Educational Objectives:

1. To identify sources of power in an IC.
2. To develop skill to analyze Bi-CMOS processes Integration and Isolation considerations.
3. To develop skill to design advanced MOSFET models
4. To inculcate skill to investigate the Performance Evaluation of Conventional CMOS and Bi-CMOS logic gates..
5. To develop skill to apply the concept of **low power** Latches and Flip flops.

UNIT-1: LOW POWER DESIGN, AN OVER VIEW (9Hr)

Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.

UNIT-2: MOS/BiCMOS PROCESSES (9Hr)

Bi-CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process.

UNIT-3 DEVICE BEHAVIOR AND MODELING (9Hr)

Advanced MOSFET models, limitations of MOSFET models, bipolar models. Analytical and Experimental characterization of sub-half micron MOS devices, MOSFET in a Hybrid mode environment.

UNIT-4: CMOS AND Bi-CMOS LOGIC GATES (9Hr)

Conventional CMOS and Bi-CMOS logic gates, Performance Evaluation.

UNIT-5: LOW- VOLTAGE LOW POWER LOGIC CIRCUITS (9Hr)

Comparison of advanced Bi-CMOS Digital circuits. ESD-free Bi-CMOS, Digital circuit operation and comparative Evaluation.

LOW POWER LATCHES AND FLIP FLOPS: Evolution of Latches and Flip flops-quality measures for latches and Flip flops, Design perspective.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Identify sources of power in an IC.	PO1, PO2 ,PO3,
CO2	Demonstrate knowledge on -CMOS processes, Integration and Isolation considerations	PO1, PO2
CO3	Design advanced MOSFET models	PO1, PO2, PO3, PO5
CO4	Analyze the Performance Evaluation of Conventional CMOS and Bi-CMOS logic gates..	PO1, PO2, PO4
CO5	Understand and apply the concept of **low power** Latches and Flip flops.	PO1, PO4

TEXT BOOKS:

1. CMOS/BiCMOS ULSI low voltage - low power, Yeo Rofail/ Gohl et.al., Pearson Education Asia 1st Indian reprint,2002.
2. Practical Low Power Digital VLSI Design, Gary K. Yeap, KAP, 2002.

REFERENCES:

1. Basic VLSI Design, Douglas A.Pucknell & Kamran Eshraghian, 3rd edition PHI.
2. Digital Integrated circuits, J.Rabaey, PH,1996
3. CMOS Digital ICs, Sung-mo Kang and yusuf leblebici, 3rd edition TMH 2003 .
4. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	3	3	-	2	-	-	-	-	-	-	-
CO4	3	2	-	3	-	-	-	-	-	-	-	-
CO5	2	-	-	3	-	-	-	-	-	-	-	-
CO*	2.6	2.5	2.5	3	2	-	-	-	-	-	-	-

IV Year B.Tech II semester	L	T	P	C
	3	0	0	3

18ECE424E SENSORS AND TRANSDUCERS (Core elective -IV)

Course Educational objectives:

1. To demonstrate basic knowledge on measurement, errors, sensors and transducers
2. To Describe Static characteristics, Dynamic characteristics and Mathematical model of Transducer.
3. To analyze different resistive transducers and characteristics.
4. To demonstrate knowledge on various inductive and capacitive transducers.
5. To illustrate various important sensors like smart sensors, digital sensors etc

UNIT I MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS (9Hr)

Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors – Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS (9Hr)

Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs

UNIT III RESISTIVE TRANSDUCERS (9Hr)

Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer

UNIT IV INDUCTIVE AND CAPACITIVE TRANSDUCER (9Hr)

Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

UNIT V MISCELLEANEOUS TRANSDUCERS (9Hr)

Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

Total Hours (45Hr)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to		POs related to COs
CO1	To demonstrate basic knowledge on measurement, errors, sensors and transducers	PO1
CO2	To Describe and analyze Static characteristics ,Dynamic characteristics and Mathematical model of Transducer.	PO1,PO2
CO3	To analyze different resistive transducers and characteristics.	PO1,PO2
CO4	To demonstrate knowledge on various inductive and capacitive transducers.	PO1,PO2
CO5	To illustrate various important sensors like smart sensors, digital sensors etc	PO1,PO2

TEXT BOOKS:

1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, Dhanpat Rai & Company Private Limited, 2007.
2. Renganathan. S,"Transducer Engineering", Allied Publishers, Chennai, 2003.

REFERENCES:

1. Doebelin. E.A, "Measurement Systems – Applications and Design", Tata McGraw Hill, New York, 2000.
2. 2. Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 1999. 3. John. P.
3. Bentley, "Principles of Measurement Systems", III Edition, Pearson Education, 2000. 4. Murthy.D.V.S, "Transducers and Instrumentation", Prentice Hall of India, 2001.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	-	-	-	-	-	-	-	-	-	-

IV Year B. TECH II Semester	L	T	P	C
	0	0	20	10

18ECE425 PROJECT WORK

Course Educational Objectives:

1. To develop the ability to undertake problem identification, formulation and solution.
2. To demonstrate the ability to engage in design and to execute to an appropriate professional standard.
3. To develop the capacity to undertake lifelong learning.
4. To develop the ability to communicate effectively, not only with engineers but also with the community at large.
5. To develop an understanding of the social, cultural, global and environmental responsibilities of the professional Engineer, and the principles of sustainable design and development

PROJECT WORK:

The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design / fabrication / analysis for a specific application, a research project with a focus on an application needed by the industry / society, a computer project, a management project or a design and analysis project. A project topic must be selected by the students in consultation with their guides. To train the students in preparing project reports and to face reviews and viva voce examination. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

Course Outcomes

On successful completion of this course, the students should be able to		POs related to COs
CO1	Demonstrate in-depth knowledge on the project topic	PO1
CO2	Identify, analyze and formulate complex problem chosen for project work to attain substantiated conclusions.	PO2
CO3	Design solutions to the chosen project problem.	PO3
CO4	Undertake investigation of project problem to provide valid conclusions.	PO4
CO5	Use the appropriate techniques, resources and modern engineering tools necessary for project work.	PO5
CO6	Apply project results for sustainable development of the society	PO6
CO7	Understand the impact of project results in the context of environmental sustainability	PO7
CO8	Understand professional and ethical responsibilities while executing the project work.	PO8
CO9	Function effectively as individual and a member in the project team.	PO9
CO10	Develop communication skills, both oral 3and written for preparing and presenting project report.	PO10
CO11	Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.	PO11
CO12	Engage in lifelong learning to improve knowledge and competence in the chosen area of the project.	PO12

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	-	-	-	-	-	-	-	-	-	-	-
CO2	-	**3**	-	-	-	-	-	-	-	-	-	-
CO3	-	-	**3**	-	-	-	-	-	-	-	-	-
CO4	-	-	-	**3**	-	-	-	-	-	-	-	-
CO5	-	-	-	-	**3**	-	-	-	-	-	-	-
CO6	-	-	-	-	-	**3**	-	-	-	-	-	-
CO7	-	-	-	-	-	-	**3**	-	-	-	-	-
CO8	-	-	-	-	-	-		**3**	-	-	-	-
CO9	-	-	-	-	-	-	-	-	**3**	-	-	-
CO10	-	-	-	-	-	-	-	-	-	**3**	-	-
C011	-	-	-	-	-	-	-	-	-	-	**3**	-
CO12	-	-	-	-	-	-	-	-	-	-	-	**3**