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)

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 2016-2017 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 176 credits and secure all 176 credits.

iv. Lateral entry students shall register for 134 credits and secure all 134 credits

3. Students, who fail to fulfill 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. DISTRIBUTION AND WEIGHTAGE OF MARKS

4.1 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.

4.2 INTERNAL EXAMINATIONS:

i. For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination consists of objective paper for 10 marks and subjective paper for 20 marks with duration of 1hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper).

Objective paper shall be for 10 marks. Subjective paper shall contain 5 questions of which student has to answer 3 questions evaluated* for 20 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 20 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 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: 25

Marks obtained in Second mid: 20

Final Internal Marks: (25x0.8) + (20x0.2) = 24

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: 25

Final Internal Marks: (25x0.8)+ (0x0.2) =20

4.3 END EXAMINATIONS:

(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.

4.4 For practical subjects there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the laboratory shall be evaluated for 30 marks by the concerned laboratory teacher based on the regularity/record/ viva. 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: Electrical & Mechanical Lab), 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.

4.5 There shall one audit pass course in 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 & 2 of the regulations.

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

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And 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 and the internal test marks will be the final sessional marks for the subject.

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

There shall be two comprehensive online examinations conducted by the respective colleges, one at the end of II year and the other at the end of III year, with 100 objective questions for 100 marks on the subjects studied in the respective semesters.

The Principal is given the responsibility of preparing question bank/ question paper and conducting the online examination maintaining confidentiality. A student shall acquire 1 credit assigned to the comprehensive online examination only when he/she secures 40% or more marks. In case, if a student fails in comprehensive online examination, he shall reappear at the next supplementary examination when offered.

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

5. ATTENDANCE REQUIREMENTS:

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

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

5.3 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.

5.4 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.

5.5 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.

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

6. MINIMUM ACADEMIC REQUIREMENTS:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**5**

6.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject 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.

6.2 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.

For I/I sem one 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.

6.3 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.

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 6.2 and 6.3 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.

6.4 MINIMUM ACADEMIC REQUIREMENTS: (For Later Entry Students)

The Following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no: 5

(i) 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 %

(ii) A Student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 36 credits (40%) of the subjects that have been studied up to III year II semester 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.

And in case if student is already detained for want of credits for particular academic year by sections 6.2 and 6.3 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.

6.5 A student shall register and put up minimum attendance in all 176 credits and earn all the 176 credits. Marks obtained in all 176 credits shall be considered for the calculation of aggregate percentage of marks obtained.

7. COURSE PATTERN:

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

7.2 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.

7.3 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.

8. 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.

9. 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 „Satisfactory‟ or “Unsatisfactory‟ shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

9.1. 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.

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

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

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

Where „Si" is the SGPA of the i^{th} semester and C_i 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.

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

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.

10. 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	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

11. TRANSITORY REGULATIONS:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment 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.

12 MINIMUM INSTRUCTION DAYS:

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

13. 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 **5**subjects at a time**.**

No revaluation for seminar, comprehensive Examination, practical and project work.

14. 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) Willful 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 (12.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.

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

15. GENERAL:

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

15.2 Malpractices rules- nature and punishments are appended.

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

15.4 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

DISCIPLINARY ACTIONS FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

Sl.no	NATURE OF MALPRACTICES/ IMPROPER CONDUCT IF THE CANDIDATE	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.

(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates 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.
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 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 to appear for the remaining 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. If the imposter is an outsider, he/she will be handed over to the police and a case is registered against him/her.

4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper or answer book or additional sheet, during or after the examination.	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	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.

	mischief which results in damage 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 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.
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.

Note

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

COURSE STRUCTURE (R-2016)

I B.Tech- I Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16SAH111	Functional English-I	SH	3	1	-	3	30	70	100
2	16SAH114	Mathematics-I	SH	3	1	-	3	30	70	100
3	16CSE111	Computer Programming	ES	3	1	-	3	30	70	100
4	16SAH112	Engineering Physics	SH	3	1	-	3	30	70	100
5	16SAH113	Engineering Chemistry	SH	3	1	-	3	30	70	100
6	16MEC112	Engineering Workshop & IT Workshop Lab	ES	-	-	3	2	30	70	100
7	16CSE112	Computer Programming Lab	ES	-	-	3	2	30	70	100
8	16SAH115	Engineering Physics And Engineering Chemistry Lab	SH	-	-	3	2	30	70	100
Contact periods per week				15	5	9	-	-	-	-
Total periods per week				29			-	-	-	-
Total credits (5 Theory + 3 Labs)							21	-	-	-
Total Marks								240	560	800

I B.Tech- II Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16SAH121	Functional English-II	SH	3	1	-	3	30	70	100
2	16SAH122	Mathematics-II	SH	3	1	-	3	30	70	100
3	16CSE121	Data Structures	ES	3	1	-	3	30	70	100
4	16MEC111	Engineering Drawing	ES	1	-	5	3	30	70	100
5	16EEE121	Electrical Circuits	ES	3	1	-	3	30	70	100
6	16EEE122	Electrical Circuits Lab	ES	-	-	3	2	30	70	100
7	16CSE122	Data Structures Lab	ES	-	-	3	2	30	70	100
8	16SAH116	English Communication Skills Lab	SH	-	-	3	2	30	70	100
Contact periods per week				13	4	14	-	-	-	-
Total periods per week				31			-	-	-	-
Total credits (5 Theory + 3 Labs)							21	-	-	-
Total Marks								240	560	800

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

II B.Tech- I Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16SAH211	Mathematics III	SH	3	1	-	3	30	70	100
2	16SAH212	Environmental Science	SH	3	1	-	3	30	70	100
3	16EEE214	Principles of Electrical Engineering	ES	3	1	-	3	30	70	100
4	16ECE211	Electronic Devices and Circuits	PC	3	1	-	3	30	70	100
5	16ECE212	Signals & Systems	PC	3	1	-	3	30	70	100
6	16ECE213	Switching Theory and Logic Design	PC	3	1	-	3	30	70	100
7	16ECE214	Electronic Devices And Circuits Lab	PC	-	-	3	2	30	70	100
8	16EEE215	Principles of Electrical Engineering Lab	ES	-	-	3	2	30	70	100
9	16AUD211	Professional Ethics	AC	2	-	-	-	-	-	-
10	P&T	English Communication Skills	P&T	2	-	-	-	-	-	-
11	P&T	Personality Development Program-I	P&T	2	-	-	-	-	-	-
Contact periods per week				24	6	6	-	-	-	-
Total periods per week				36			-	-	-	-
Total credits (6 Theory + 2 Labs)							22	-	-	-
Total Marks								240	560	800

II B.Tech- II Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16SAH221	Mathematics IV	SH	3	1	-	3	30	70	100
2	16MBA218	Business Management	SH	3	1	-	3	30	70	100
3	16ECE221	Electronic Circuit Analysis	PC	3	1	-	3	30	70	100
4	16ECE222	Pulse And Digital Circuits	PC	3	1	-	3	30	70	100
5	16ECE223	Probability Theory & Stochastic Process	PC	3	1	-	3	30	70	100
6	16ECE224	Electromagnetic Theory	PC	3	1	-	3	30	70	100
7	16ECE225	Electronic Circuit Analysis Lab	PC	-	-	3	2	30	70	100
8	16ECE226	Pulse and Digital Circuits Lab	PC	-	-	3	2	30	70	100
9	16ECE227	Online Comprehensive Test-I	EEC	2	-	-	1	-	-	P
10	P&T	Personality Development Program-II	P&T	2	-	-	-	-	-	-
Contact periods per week				22	6	6	-	-	-	-
Total periods per week				34			-	-	-	-
Total credits (6 Theory + 2 Labs)							23	-	-	-
Total Marks								240	560	800

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III B.Tech- I Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE311	Analog Communications	PC	3	1	-	3	30	70	100
2	16ECE312	Linear and Digital IC Applications	PC	3	1	-	3	30	70	100
3	16ECE313	VLSI Design	PC	3	1	-	3	30	70	100
4	16ECE314	Computer Organization	PC	3	1	-	3	30	70	100
5	16ECE315	Digital Design Through Verilog HDL	PC	3	1	-	3	30	70	100
6	16EEE223	Control Systems	ES	3	1	-	3	30	70	100
7	16ECE316	IC Applications Lab	PC	-	-	3	2	30	70	100
8	16ECE317	Digital Design Through Verilog HDL Lab	PC	-	-	3	2	30	70	100
9	P&T	Reasoning and Aptitude-I	EEC	2	-	-	-	-	-	-
Contact periods per week				15	4	11	-	-	-	-
Total periods per week				30			-	-	-	-
Total credits (6 Theory + 2 Labs)							22	-	-	-
Total Marks								240	560	800

III B.Tech- II Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE321	Digital Communications	PC	3	1	-	3	30	70	100
2	16ECE322	Microprocessor and Microcontroller	PC	3	1	-	3	30	70	100
3	16ECE323	Digital Signal Processing	PC	3	1	-	3	30	70	100
4	16ECE324	Transmission Lines and Antenna Wave Propagation	PC	3	1	-	3	30	70	100
5	16ECE325	**Core Elective-I**	CE	3	1	-	3	30	70	100
6	OE-I	**Open Elective-I**	OE	3	1	-	3	30	70	100
7	16ECE326	Analog and Digital Communications Lab	PC	-	-	3	2	30	70	100
8	16ECE327	Microprocessor and Embedded Systems Lab	PC	-	-	3	2	30	70	100
9	16ECE328	On-line Comprehensive Test-II / Massive Open Online Course	EEC/OE	2/0	-	-	1	-	-	P
10	P&T	Reasoning and Aptitude-II	EEC	2	-	-	-	-	-	-
Contact periods per week				22	6	6	-	-	-	-
Total periods per week				34			-	-	-	-
Total credits (6 Theory + 2 Labs)							23	-	-	-
Total Marks								240	560	800

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IV B.Tech- I Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE411	Optical Fibre Communications	PC	3	1	-	3	30	70	100
2	16ECE412	Digital Image Processing	PC	3	1	-	3	30	70	100
3	16ECE413	Microwave Engineering	PC	3	1	-	3	30	70	100
4	16ECE414	**Core Elective-II**	CE	3	1	-	3	30	70	100
5	16ECE415	**Core Elective-III**	CE	3	1	-	3	30	70	100
6	OE-II	**Open Elective-II**	OE	3	1	-	3	30	70	100
7	16ECE416	Microwave and Optical Communication Lab	PC	-	-	3	2	30	70	100
8	16ECE417	Digital Image and Signal Processing Lab	PC	-	-	3	2	30	70	100
Contact periods per week				18	6	6	-	-	-	-
Total periods per week				30			-	-	-	-
Total credits (6 Theory + 2 Labs)							22	-	-	-
Total Marks								240	560	800

IV B.Tech- II Semester

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE421	Satellite Communications	PC	3	1	-	3	30	70	100
2	16ECE422	Radar Systems	PC	3	1	-	3	30	70	100
3	16ECE423	**Core Elective-IV**	CE	3	1	-	3	30	70	100
4	16ECE424	**Core Elective-V**	CE	3	1	-	3	30	70	100
5	16ECE425	Project Work	EEC	18	-	-	10	30	70	100
Contact periods per week				30	4	-	-	-	-	-
Total periods per week				34			-	-	-	-
Total credits (4 Theory + 1 Project Work)							22	-	-	-
Total Marks								150	350	500

CORE ELECTIVES

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

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE325A	Electronic Measurements and Instrumentation	CE	3	1	-	3	30	70	100
2	16ECE325B	Fundamentals of Nano-Electronics	CE	3	1	-	3	30	70	100
3	16ECE325C	Arduino Based System Design	CE	3	1	-	3	30	70	100
4	16ECE325D	Multimedia Compression and Network	CE	3	1	-	3	30	70	100

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

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE414A	Micro Electro Mechanical Systems	CE	3	1	-	3	30	70	100
2	16ECE414B	Cellular Mobile Communications	CE	3	1	-	3	30	70	100
3	16ECE414C	Advanced Digital Signal Processing	CE	3	1	-	3	30	70	100
4	16ECE414D	Computer Networks	CE	3	1	-	3	30	70	100

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

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE415A	FPGA Design	CE	3	1	-	3	30	70	100
2	16ECE415B	Low Power VLSI Design	CE	3	1	-	3	30	70	100
3	16ECE415C	Modern Digital Communication Techniques	CE	3	1	-	3	30	70	100
4	16ECE415D	Wireless Communication Networks	CE	3	1	-	3	30	70	100

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

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE423A	Advanced Computer Architecture	CE	3	1	-	3	30	70	100
2	16ECE423B	Pattern Recognition	CE	3	1	-	3	30	70	100
3	16ECE423C	RF Integrated Circuits	CE	3	1	-	3	30	70	100
4	16ECE423D	Cyber Security	CE	3	1	-	3	30	70	100

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

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	16ECE424A	Embedded Real Time Operating System	CE	3	1	-	3	30	70	100
2	16ECE424B	Artificial Neural Network	CE	3	1	-	3	30	70	100
3	16ECE424C	Bio-Medical Instrumentation	CE	3	1	-	3	30	70	100
4	16ECE424D	Advanced Microcontrollers	CE	3	1	-	3	30	70	100

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Note: SH- Science and Humanities; PC – Professional Core; ES – Engineering Science; CE- Core Elective; OE- Open Elective; EEC- Employability Enhancement Courses; AC – Audit Course

OPEN ELECTIVE-I

III B.Tech- II Semester

Offered Department	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
S&H	16OSAH321	LASER and Fiber Optics	OE	3	1	-	3	30	70	100
	16OSAH322	Advanced Mathematics	OE	3	1	-	3	30	70	100
	16OSAH323	Mathematical Modeling	OE	3	1	-	3	30	70	100
CSE	16OCSE321	Object Oriented Programming	OE	3	1	-	3	30	70	100
	16OCSE322	Python Programming	OE	3	1	-	3	30	70	100
	16OCSE323	Web Programming	OE	3	1	-	3	30	70	100
CE	16OCIV321	Construction Equipment, Planning & Management	OE	3	1	-	3	30	70	100
	16OCIV322	Remote sensing and GIS	OE	3	1	-	3	30	70	100
	16OCIV323	Green Buildings and Energy Conservation	OE	3	1	-	3	30	70	100
EEE	16OEEE321	Power Plant Instrumentation	OE	3	1	-	3	30	70	100
	16OEEE322	Neural Networks & Fuzzy Systems	OE	3	1	-	3	30	70	100
	16OEEE323	Sensors and Instrumentation	OE	3	1	-	3	30	70	100
MECH	16OMEC321	Industrial Robotics	OE	3	1	-	3	30	70	100
	16OMEC322	Optimization Techniques	OE	3	1	-	3	30	70	100
	16OMEC323	Mechatronics	OE	3	1	-	3	30	70	100

OPEN ELECTIVE-II

IVB.Tech- I Semester

Offered Department	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
S&H	16OSAH411	Applications of Graph Theory	OE	3	1	-	3	30	70	100
	16OSAH412	Introduction to Nano-Science and Technology	OE	3	1	-	3	30	70	100
	16OSAH413	Entrepreneurship Development	OE	3	1	-	3	30	70	100
CSE	16OCSE411	Data Base Management Systems	OE	3	1	-	3	30	70	100
	16OCSE412	Internet of Things	OE	3	1	-	3	30	70	100
	16OCSE413	Information Security	OE	3	1	-	3	30	70	100
CE	16OCIV411	Transport and Environment	OE	3	1	-	3	30	70	100
	16OCIV412	Disaster Management	OE	3	1	-	3	30	70	100
	16OCIV413	Air Pollution and Control Engineering	OE	3	1	-	3	30	70	100

EEE	16OEEE411	Energy Auditing and Demand Side Management	OE	3	1	-	3	30	70	100
	16OEEE412	Fundamentals of Electrical Estimation and Costing	OE	3	1	-	3	30	70	100
	16OEEE413	Fundamentals of Electrical Power Utilization	OE	3	1	-	3	30	70	100
MECH	16OMEC411	Quality Control and Reliability Engineering	OE	3	1	-	3	30	70	100
	16OMEC412	Industrial Engineering and Psychology	OE	3	1	-	3	30	70	100
	16OMEC413	Power Generation Technologies	OE	3	1	-	3	30	70	100

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	Subject Code	Subject	Category	Offered Semester	Scheme of Instructions Periods per Week			
					L	T	P/ D	C
1	P&T	English Communication Skills	EEC	II-I	2	-	-	-
2	P&T	Personality Development Program-I	EEC	II-I	2	-	-	-
3	P&T	Personality Development Program-II	EEC	II-II	2	-	-	-
4	16ECE227	On-line Comprehensive Exam-I	EEC	II-II	2	-	-	1
5	P&T	Reasoning and Aptitude-I	EEC	III-I	2	-	-	-
6	P&T	Reasoning and Aptitude-II	EEC	III-II	2	-	-	-
7	16ECE328	On-line Comprehensive Exam-II	EEC	III-II	2	-	-	1
8	16ECE425	Project Work	EEC	IV-II	18	-	-	10
Total					32			12

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.	SH	14	8	6	6	-	-	-	-	34
2.	ES	7	13	5	-	3		-	-	28
3.	PC	-	-	11	16	19	16	13	6	81
4.	CE	-	-	-	-	-	3	6	6	15
5.	OE	-	-	-	-	-	3	3	-	6
6.	EEC	-	-	-	1	-	1	-	10	12
7.	AC	-	-	0	-	-	-	-	-	-
Total		**21**	**21**	**22**	**23**	**22**	**23**	**22**	**22**	**176**

Note: SH- Science and Humanities; PC – Professional Core; ES – Engineering Science; CE- Core Elective; OE- Open Elective; EEC- Employability Enhancement Courses; AC – Audit Course

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PERCENTAGE –WISE CREDIT DISTRIBUTION

S.No	Category	Credits Allocated	Percentage –wise Credit Distribution
1	Basic Sciences	20	11.36
2	Engineering Sciences	28	15.91
3	Humanities and Social Sciences	14	7.95
4	Program Core	81	46.03
5	Program Electives	15	8.52
6	Open Electives	6	3.40
7	Project(s)	10	5.68
8	PDP, Online Tests (Others)	2	1.13
Total		**176**	**100**

I B.Tech I Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16SAH111 FUNCTIONAL ENGLISH-I
(Common to All Branches)

Course Educational Objectives:

CEO1: To provide knowledge on behavioral aspects, developing vocabulary by deriving various Ways of Functional English words used.
CEO2: To acquire Entrepreneurship skills, usage of grammar aspects.
CEO3: To cultivate self confidence in one's life
CEO4: Get contextual knowledge to recognize the need of ability to engage in independent and Life-long learning in the broadest context of Technological change.
CEO5: To cultivate Individual, Team work and Adaptability skills in work place.

UNIT-I

(a**) SUBHA-** a Short Story- by ***Rabindranath Tagore***
(b) **THE ONLY AMERICAN FROM OUR VILLAGE** –A short story- by***ArunJoshi***
Exercises: 1.Creating Short Stories: (speaking activity by students) 2.Synonyms and Antonyms3.Reading Comprehension Skills4. Nouns-Kinds and Uses 5. Pronouns-Kinds and Uses .

UNIT-II

AZIM PREMJI–an Entrepreneur-***web source***
Exercises: 1. What are the Skills Necessary for an Entrepreneur-Discuss. (Speaking Activity by Students) 2. Synonyms and Antonyms 3. Cloze Test 4. Adjectives-Types –Comparison 5. Articles.

UNIT-III

THE LITTLE BLACK BOY –A poem- by***William Blake***
Exercises: 1.Which is Necessary for a Human being either Skin Complexion or Attitude-Discuss? (Speaking Activity by Students)2. Jumbled Sentences. 3. Adverbs-Kinds and Uses.

UNIT-IV

THE YEAR 2050-Reflections of a futurist- by***Theodore J. Gordon***
Exercises: 1. what are the Renewable and Non Renewable Energy Sources-Discuss? 2. Synonyms and Antonyms3. Developing Hints 4. Prepositions – Types-Uses 5.Conjunctions-Types-Uses.

UNIT-V

(a)WHITE WASHING THE FENSE-Team Work Skills-by***MarkTwain***
(b) SENOR PAYROLL –Adaptability Skills- by***William E. Barrett***
Exercises: 1. Is Soft Skills Necessary for a Professional-Discuss? 2. Synonyms and Antonyms 3.Letter Writing-Official 4. E-mail Writing 5.Writing Reports.

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Knowledge on behavioral aspects and communicate effectively with others.	PO1,PO10
CO2	Knowledge on acquiring entrepreneurship skills and writing skills.	PO1, PO9,PO10
CO3	Cultivate knowledge to gain confidence in one's life skills.	PO1, PO9
CO4	Knowledge in recognizing the need of ability to engage independently and life-long learning through communicating in English.	PO1,PO10, PO12
CO5	Develop knowledge on Individual, Team work skills and Adaptability skills on the usage of foreign language words.	PO1,PO9

Text Books:

The text book prepared by the Department of English of SITAMS will be issued to students.

Reference Books:

1. English for Students of Science, A. Roy, P.L.Sharma, Orient Longman, New Delhi, 2005.
2. Inspiring lives, Dr. Jandhyala Ravindranath & Dr. M.Sarat Babu, Maruti Publications, Guntur, 2009.
3. Technical Communication Principle and Practice, Meenakshi Raman and Sangita Sharma, Oxford University Press, New Delhi, 2009.
4. Essential Grammar in Use, (with CD) 3/e, Cambridge University Press, New Delhi, 2009.
5. Communication Skills for Technical Students, Farhathullah, T.M., Orient Blackswan, Chennai, 2008.
6. Murphy's English Grammar, Raymond Murphy.
7. Cambridge English Dictionary for Advanced Learners (with CD).

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	-	-	-	-	-	-	-	3	-	-	-
CO4	3	-	-	-	-	-	-	-	-	3	-	3
CO5	3	-	-	-	-	-	-	-	3	-	-	-
CO*	3	-	-	-	-	-	-	-	2.66	3	-	3

I B.Tech I Sem

		L	T	P	C
16SAH114	**MATHEMATICS – I**				
	(Common to all Branches)	**3**	**1**	**0**	**3**

Course Educational Objectives:

CEO1: 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

CEO2: To identify important characteristics of higher order ordinary differential equations (HOODE) and develop appropriate method of obtaining solutions of HOODE

CEO3: 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 multivariable.

CEO4: 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 ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE AND ITS APPLICATIONS

Exact equations, Equations reducible to exact, Linear and Bernoulli's equation, **Applications** : Orthogonal Trajectories, Simple Electrical Circuits, Newton's law of cooling only.

UNIT– 2 LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER

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.

UNIT– 3 DIFFERENTIAL CALCULUS AND ITS APPLICATIONS

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– 4 LAPLACE TRANSFORM - I

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

UNIT– 5 LAPLACE TRANSFORM – II

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.

Course Outcomes

On successful completion of the course, Students will be able to		POs related to COs
CO1	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, electrical circuits and orthogonal trajectories	PO1,PO2,PO3
CO2	Demonstrate 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	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
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	Demonstrate knowledge in Laplace transform of some special functions to develop analytical skills in solving problems involving initial value problems for constant coefficient linear ordinary differential equations using Laplace transform	PO1,PO2,PO3

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

I B.Tech I Sem

L	T	P	C
3	1	0	3

16CSE111 COMPUTER PROGRAMMING
(Common to All Branches)

Course Educational Objectives:

CEO1: To provide a complete study of the basics of C-programming language.

CEO2: To understand the impact of Selection, repetition statements and arrays in C Programming

CEO3: To know the functions and strings in C-programming language

CEO4: To realize dynamic memory allocation and reallocation

CEO5: To explain the File handling functions in C-programming language

UNIT- 1 OVERVIEW OF COMPUTERS AND C PROGRAMMING BASICS

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, REPETITION STATEMENTS AND ARRAYS

Selection Statements: if statements - switch statement - Unconditional statements.

Iteration Statements: for statement – while statements – do-while statement -**Arrays:** Initialization – Declaration - One-dimensional arrays-Two-dimensional arrays – Multi-dimensional arrays.

UNIT- 3 FUNCTIONS AND STRINGS

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 – Multi File Programs.

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

Pointers: Definition – Initialization – Pointers arithmetic – Pointers and arrays – Dynamic memory allocation and deallocation. **Structure**: 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 - Programs using structures and Unions – Bit Fieds – Type Def - Enum.

UNIT- 5 FILE HANDLING

File accessing methods – sequential access and random access- Basic operations on Files –Command line arguments - File handling functions- Pre-processor directives.

Course Outcomes:

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

Text Books:

1. Computer Science, 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, E.Balaguruswamy, Tata McGraw Hill, New Delhi, 2012.

Reference Books:

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
2. Let Us C, Yashavant P. Kanetkar, BPB Publications, 2011.
3. Programming with C, Schaum's Outlines, Byron S Gottfried, Second Edition, Tata McGraw-Hill, 2006.
4. The C Programming language, Kernighan,B.W and Ritchie,D.M, 2nd Edition, Pearson Education,2006
5. Computer Fundamentals and Programming in C, Anita Goel and Ajay Mittal, 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	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	3	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	**2.8**	**2.8**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

I B.TECH I SEM

L	T	P	C
3	1	0	3

16SAH112 ENGINEERING PHYSICS
(Common to all branches)

Course Educational Objectives:

CEO1: To understand the principles and applications optics, Lasers and Optical Fibers in Various Streams of Engineering .

CEO2: To analyze the structure of crystals by using X-Ray Diffraction Technique and to study properties, productions and applications of ultrasonic.

CEO3: To develop ideas & mathematical solutions to Quantum mechanics & Semiconductors.

CEO4: To recognize the concepts of Superconductors and classification of magnetic Materials.

CEO5: To Introduce Nano-materials & their applications in various fields of science and Technology.

UNIT - 1: PHYSICAL OPTICS, LASERS AND FIBER OPTICS

Physical Optics: Interference in thin films by Reflection Qualitative -Newton's Rings (Qualitative) – Diffraction –Fraunofer Diffraction at single slit-Diffraction Grating.

Lasers: Laser characteristics - Spontaneous and Stimulated Emissions - Population Inversion - SolidState Laser (Ruby Laser) - Gas (He-Ne) Laser - Semiconductor (GaAs) Laser - Applications of Lasers.

Fiber Optics: Structure of optical Fiber - Types of optical Fibers - Numerical Aperture - Fiberopticsin Communications - Applications.

UNIT - 2: CRYSTAL STRUCTURES AND ULTRASONICS

Crystal Structures: Introduction - Space Lattice - Unit Cell - Lattice Parameters - BravisLatticesCrystal Systems - Structures of Simple Cubic - Body Centered Cubic - Face Centered Cubic Crystals - Miller Indices - Bragg's law - X-ray Diffraction - Laue Methods.

Ultrasonics: Introduction - Production of Ultrasonic Waves by Piezoelectric Method - Properties ofUltrasonic Waves - Applications of Ultrasonics.

UNIT - 3: QUANTUM MECHANICS AND SEMI CONDUCTORS

Quantum Mechanics: Matter Waves and Properties -De Broglie's Concept of Matter Waves-OneDimensional Time Independent Schrodinger's Wave Equation - Particle in One Dimensional Potential box.**Semiconductors:** Intrinsic and Extrinsic Semiconductors (Qualitative) - Drift and Diffusion - Einstein's Relation - Hall Effect - Direct and Indirect Band Gap Semiconductors - P-N Junction.

UNIT - 4: MAGNETIC MATERIALS AND SUPERCONDUCTIVITY

Magnetic Materials: Origin of Magnetic Moment of an Atom - Classification of Dia - Para - FerroMagnetic Materials on the basis of Magnetic Moment(Qualitative) - Hysteresis Curve - Soft and Hard Magnetic Materials with Applications.

Superconductivity: General Properties - Meissner effect - Types of Superconductors - BCS Theory - Josephson's effect - Applications of Superconductors.

UNIT - 5: PHYSICS OF NANOMATERIALS

Nano Materials: Introduction to Nanomaterials–Significance of Nanoscale- Surface to Volume Ratio

- Synthesis of Nanomaterials - Ball Milling Method - Chemical Vapour Deposition methods – Optical, Thermal, Mechanical and Electrical Properties of Nano Materials - Applications of Nanomaterials.

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,PO3
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

Text Books:

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

Reference Books:

1. Concepts of Modern Physics, AurtherBeiser, 8/e, Tata McGraw Hill Publishers, 2007,New Delhi.
2. Modern Engineering Physics, A.S. Vasudeva, S. Chand & Co., 2012,New Delhi.
3. Materials Science, M. Vijaya and G. Rangarajan, , 1/e ,Tata McGraw Hill Publishers, 2004,New Delhi.
4. Physics,Part I and II ,Halliday and Resnick(Part I 5/e,2002, Part II 5/e,2001),John Wiley & sons (Asia).
5. Engineering Physics, Gaur & Gupta, 7/e, DhanpatiRai Publications, New Delhi,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	2	2	2									
CO4	3	2	-									
CO5	3	-	-									
CO*	**2.6**	**2.25**	**2**									

I B.TECH I SEM	L	T	P	C
	3	1	0	3

16SAH113 ENGINEERING CHEMISTRY
(Common to all branches)

Course Educational Objectives:

CEO1: To learn different purification method and analysis the impurities present in water.

CEO2: To develop skill to describe the mechanism and control of corrosion.

CEO3: To train the students to effectively use the knowledge of polymer science.

CEO4: To learn the concept of phase rule, structural materials and refractories

CEO5: To apply the concept of Lubricants and Electrochemistry.

UNIT- 1: WATER AND WATER FOR INDUSTRIAL PURPOSE

Water: Sources of Water - Types of Impurities in Water - Hardness of Water - Temporary andPermanent Hardness - Estimation of Hardness by EDTA Method - 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

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 Corrosion - Control of Corrosion - Cathodic Protection - Sacrificial Anode and Impressed Current.

UNIT - 3: POLYMERS

Polymerization Reactions - Basic Concepts - Types of Polymerization - Addition and Condensation Polymerization - Plastics -Thermosetting and Thermoplastics - Composition - Properties - Engineering Uses 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

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 Hardeningof Cement (Reactions).

Refractories: Definition - Classification with Examples - Criteria of a Good Refractory Material - Causes For the Failure of Refractory Materials.

UNIT - 5: LUBRICANTS AND ELECTRO CHEMISTRY

Lubricants: Principles and Function of Lubricants - Classification and Properties of Lubricants - Viscosity - Flash and Fire Points - Cloud and Pour Points - Aniline Point - Neutralization Number and Mechanical Strength.

Electro Chemistry: Conductance - Equivalent Conductance - Molar Conductance– ConductometricTitrations - Conductivity Measurements.

Fuel Cells: Hydrogen Oxygen Fuel Cell and Methanol Fuel Cell.

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,PO3
CO2	Demonstrate the knowledge in corrosion phenomenon and develop skills in different methods for control of corrosion	PO1, PO2,PO3
CO3	Demonstrate the knowledge on polymeric materials and to prepare polymeric material for environmental safety .	PO1, PO2,PO3,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, Prof. K. N. Jayaveera, Dr. G. V. Subba Reddy and Dr. C. Ramachandraiah, 4/e, Tata McGraw Hill Publishers, 2009, New Delhi.
2. Text book of Engineering Chemistry, Jain and Jain, 15/e, DhanpatRai Publishing Company, 2008,New Delhi.
3. Text book of Engineering Chemistry, S. S. Dara18/e,, S. Chand & Co, 2008, New Delhi.

Reference Books:

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

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	3	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2.2	2	-	-	-	3	-	-	-	-	-

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

I B. Tech I Semester

L	T	P	C
0	0	3	2

16 MEC112 ENGINEERING WORKSHOP AND IT WORKSHOP LAB

(Common to all Branches)

Course Educational Objectives:

CEO1: To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical and electrical engineering.

CEO2: To include training on PC Hardware, Internet & World Wide Web and Productivity Tools including Word, Excel and Power Point.

ENGINEERING *WORKSHOP:*

- **TRADES FOR EXERCISES:**

1. **Carpentry:** Two exercise from: Middle T lap joint - Dove tail lap joint - Mortise and tenonjoint 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 of22 or 20 gauge G.I. sheet.
3. **Fitting:** Two exercise from: Square joint - V joint - Dove tail joint from out of 50 x 50 x 5mm 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.

- **TRADES FOR DEMONSTRATION:**
  - **a.** Drilling machine.
  - **b.** Lathe machine.
  - **c.** Grinding machine.

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

ITWORKSHOP*:*

Course Educational Objectives:

CEO1: The Objective of this Course include Training on Pc Hardware, Internet & World Wide Web and
Productivity Tools including Word, Excel and Power Point.

CEO2: PC Hardware Introduces the Students to a Personal Computer and its Basic Peripherals, the Process of Assembling a Personal Computer, Installation of System Software Like Ms Windows, Linux and the Required Device Drivers. In Addition Hardware and Software Level Troubleshooting Process, Tips and Tricks would be covered. The Students Should Work on Working PC to Disassemble and Assemble to Working Condition and Install Windows andLinux Operating Systems on the Same PC. Students are Suggested to Work Similar tasks in the Laptop Scenario wherever Possible.

CEO3: Internet & World Wide Web Module introduces the Different ways of Hooking the PC on to the Internet from Home and Workplace and Effectively usage of the Internet. Usage of Web Browsers, Email, Newsgroups and Discussion Forums would be covered. In Addition, Awareness of Cyber Hygiene, i.e., protecting the Personal Computer from Getting Infected with the viruses, Worms and other Cyber-Attacks would be introduced.

CEO4: Productivity Tools Module would enable the Students in Crafting Professional Word Documents, Excel Spread Sheets and Power Point Presentations using the Microsoft Suite of Office Tools.

PC HARDWARE:

WEEK 1: Identify the Peripherals of a Computer, Components in a CPU and its Functions. Draw theBlock Diagram of the CPU along with the Configuration of each Peripheral and Submit to Your Instructor.

WEEK 2: Every Student should Disassemble and Assemble the PC Back To Working Condition. LabInstructors 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 would be given as Part of the Course Content.

WEEK 3: Every Student should Individually Install MS Windows on the Personal Computer. LabInstructor Should Verify the Installation and Follow it up with a Viva.

WEEK 4: Every Student should install Linux on the Computer. This Computer should have WindowsInstalled. 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.

MS-WORD:

WEEK 5 : Word Orientation: The Mentor Needs to Give an Overview of Microsoft (MS) Office2007: Importance of and MS office 2007 Word as word Processors, Details of the three Tasks and Features that would be Covered in using Word – Accessing Overview of Toolbars- Saving Files - Using help and Resources- Rulers- Format Painter.

TASK 5.1: Using Word to Create Project Certificate. Features to be covered:-Formatting Fonts inWord-Drop Cap in Word- Applying Text Effects- Using Character Spacing-Borders and Colors-Inserting Header and Footer- Using Date and Time Option in Word.

WEEK 6: Creating Project Document: Features to be Covered:-Formatting Styles-Inserting Table-Bullets and Numbering- Changing Text Direction- Cell alignment- Footnote- Hyperlink- Symbols-Spell Check- Track Changes.

WEEK 7: Creating a Newsletter: Features to be Covered:- Table of Content- Newspaper Columns-Images from Files and Clipart- Drawing Toolbar and Word Art- Formatting Images- Textboxes-Paragraphs and Mail Merge in Word.

EXCEL:

WEEK 8: Excel Orientation: The Mentor Needs to tell the Importance of MS Office 2007 Excel as aSpreadsheet Tool- Give The Details of the Two Tasks and Features that would be Covered in each. Using Excel – Accessing- Overview of Toolbars- Saving Excel Files- Using Help and Resources.
Calculating GPA – .Features to be Covered:- Gridlines- Format Cells- Summation- Auto fill-Formatting Text. Cell Referencing- Formulae in Excel – average- std. deviation- Charts- Renaming and Inserting Worksheets- Hyper Linking- Count Function- Sorting.

POWER POINT:

Week 9: Students will be working on Basic Power Point Utilities and Tools which help them CreateBasic Power Point Presentation. Topic Covered during this Week Includes :- PPT Orientation-Slide Layouts- Inserting Text- Word Art- Formatting Text- Bullets and Numbering- Auto Shapes-Lines and Arrows Hyperlinks- Inserting –Images- Clip Art- Audio- Video- Objects- Tables and Charts

Course Outcomes:

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. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2. Introduction to Computers, Peter Norton, 6/e ,McGraw Hill
3. Upgrading and Repairing, Scott Muller QUE, PC's 18th e ,Pearson Education.
4. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
5. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson.

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	-	-	-	-	-	-	-	-	2	-	-	-
CO7	-	-	-	-	-	-	-	-	-	2	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	2
CO*	**3**	**3**	**3**	**-**	3	-	-	3	2	**2**	**-**	**2**

I B.Tech I Semester

L	T	P	C
0	0	3	2

16CSE112 COMPUTER PROGRAMMING LAB
(Common to All Branches)

Course Educational Objectives:

CEO1: To exposed to problem solving techniques and flow charts.

CEO2: To familiar with programming in C.

CEO3: To Learn to use Arrays, strings, functions, structures and unions.

Exercise-1:

a. Write a C Program to Convert the Temperature Unit from Fahrenheit to Celsius using the Formula C= (F-32)/1.8.
b. 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.
c. Write a C Program to Calculate the Simple Interest.

Exercise-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. 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

Exercise-3:

a. Write a C Program to find the Roots of Quadratic Equation.
b. 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)

Exercise-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.

Exercise-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.

Exercise-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 = $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$

Exercise-7:

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

Exercise-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.

Exercise-9:

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

Exercise-10:

a. Write a C Program that uses Functions to Perform the Following Operations:
   i) To Insert a Sub-String into a Given Main String from a Given Position.
   ii) To Delete n Characters from a Given Position in a Given String.
b. Write a C Program to Determine if the Given String is a Palindrome or Not.

Exercise-11:

a. Write a C Program that Displays the Position or Index in the String S where the String T Begins, or – 1 if S doesn't Contain T.
b. Write a C Program to Count the Lines, Words and Characters in a Given Text.

Exercise-12:

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 Ten Students and Displays Result Table. Also Display Student Information Separately Who Got the Highest Total. Use Structures.

Exercise-13:

Write a C Program that uses Functions to Perform the Following Operations:

i) Reading a Complex Number ii) Writing a Complex Number
iii) Addition of two Complex Numbers iv) Multiplication of two Complex Numbers

(Note: Represent Complex Number using a Structure.)

Exercise-14:

a. Write a C Program which Copies one File to Another.
b. Write a C Program to Reverse the First n Characters in a File.
   (Note: The File Name and n are Specified on the Command Line.)

Exercise-15:

a. Write a C Program to Display the Contents of a File.
b. Write a C Program to Merge two Files into a Third File (i.e., the Contents of the First File Followed by those of the Second are Put in the Third File)

Course Outcomes:

On Successful completion of this course, the students will able to		**POs related to COs**
CO1	Develop algorithms and flowcharts for given problems	PO1
CO2	Implement conditionals and loops to design the C programming	PO2
CO3	Develop C programs step-wise by defining functions and calling them.	PO3
CO4	Implement lists, set, and dictionaries to develop C program.	PO4
CO5	Build C Programs using 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 and dictionaries implementing programs in future.	PO12

Reference Books:

1. Programming in C and Data Structures, E.Balaguruswamy, 2/e, Tata McGraw Hill.
2. Let us C, Yashavant Kanetkar, BPB, Thirteenth Revised and Updated edition, 2013.

CO-PO Mapping

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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
0	0	3	2

16SAH115 ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LAB
(Common to all Branches)

ENGINEERING PHYSICS LAB

Course Educational Objectives:

CEO1: To make the students to recognize the important of optical phenomenon like Interference and diffraction.

CEO2: To make the students to understand the role of optical fiber parameters and signal losses in communication.

CEO3: To know the importance of energy gap in the study of conductivity and hall effect in semiconductors

CEO4: To understand the applications of B- H curve.

CEO5: To learn the applications of laser in the field of science, technology and in medicine

LIST OF EXPERIMENTS:

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:

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on various Phenomena related to physical Optics	PO1
CO2	Analyze the results to determine the magnetic properties	PO2
CO3	Analyse and interpret conductivity properties of semiconductors	PO4
CO4	Follow ethical principles in conducting various experiments of Engineering Physics	PO8
CO5	Do experiments effectively as an individual and as a member in a group.	PO9
CO6	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO7	Continue updating their skill related to various Physics concepts	PO12

CO-PO Mapping

	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
CO	3	3	-	3	-	-	-	3	3	3	-	3

ENGINEERING CHEMISTRY LAB

Course Educational Objectives:

CEO1: Demonstrate Knowledge on measurement of various analysis of water treatment methods

CEO2: Identify the different salt analysis of copper for engineering and technological applications.

CEO3: Provide valid conclusions on phenomena of dissolved oxygen.

LIST OF EXPERIMENTS:

1. Preparation of Standard Potassium Dichromate and Estimation of Ferrous Iron.
2. Preparation of Standard Potassium Dichromate and Estimation of Copper by Iodometry.
3. Preparation of Standard EDTA solution and Estimation of Hardness of Water.
4. Preparation of Standard EDTA and Estimation of Copper.
5. Determination of Manganese in Steel and Iron in Cement.
6. Determination of strength of the given Hydrochloric acid against standard sodium hydroxide Solution by Conductometric titration.
7. Determination of viscosity of the given oils through Redwood viscometer.
8. Estimation of dissolved oxygen in given water sample.
9. Determination of P^H of a given solution by P^H meter.
10. Estimation of alkalinity of water.

Course Outcomes:

On successful completion of the course the will be able to,		**POs related to COs**
CO1	**Demonstrate** Knowledge on measurement of various analysis of water treatment methods	PO1
CO2	**Identify** the different salt analysis of copper for engineering and technological applications.	PO2
CO3	**Provide** valid conclusions on phenomena of dissolved oxygen.	PO4
CO4	**Follow ethical** values during conducting of alkalinity of water samples.	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

	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
CO	**3**	**3**	**-**	**3**	**-**	-	**-**	**3**	**3**	**3**	**-**	**3**

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

I B.Tech. II-Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16SAH121 FUNCTIONAL ENGLISH-II
(Common to All Branches)

Course Educational Objectives:

CEO1: To provide knowledge on Behavioral aspects, developing vocabulary by deriving various ways of **F**unctional Indian words used in English

CEO2: To acquire knowledge on Verbal and Non-Verbal communication skills

CEO3: To cultivate Self Confidence in one's life..

CEO4: To gain knowledge on the achievements made by the Scientists

CEO5: To develop knowledge in protecting Environment

UNIT-I

(a)UNDER THE BANYAN TREE-a short story-by ***R.K.Narayan***

Exercises: 1.What do we learn from trees-Discuss (Speaking activity by students) 2. Synonyms and Antonyms 2.Tenses-Types 3.Transitive and Intransitive Verbs

UNIT-II

COMMUNICATION SKILLS FOR PORFESSIONALS

(a) Communication – Verbal-Areas of Communication-Suggestions to improve verbal Communication – Importance of Body Language

(b) Non-verbal Communication- Category and Features – Cultural differences in Non-verbal communication – Suggestions to improve Non-verbal Communication.

Exercises: 1. Discuss a few interesting Cross cultural aspects of communication (Speaking activity by students) 2.Voice of Verbs 3. Direct and Indirect speech 4. Modal Verbs

UNIT-III

THE LAST RIDE TOGETHER – a poem- by ***Robert Browning***

Exercises: 1.Which is important in life-money or love?-Discuss (Speaking activity by students) 2.Expansion of Proverbs-(oral and written) 3.Conditional clauses 4. Note making 5.Question Tags

UNIT-IV

(a) TECHNOLOGY WITH A HUMAN FACE-a lecture-by ***E.F.Schumacher***

(b) DR. APJ. ABDUL KALAM –A Missile Man –*web source*

Exercises: 1.Is technology a boon or bane?-Discuss (Speaking activity by students) 2. Synonyms and Antonyms 3. Idioms 4.Phrasal verbs 5.Subject Verb agreement 4.Analogy

UNIT-V

WANGARI MATHAAI-a Kenyan environmental and political activist -***from inspiring lives***

Exercises: 1.Have a discussion regarding current environmental issues (Speaking activity by students) 2.Synonyms and Antonyms 3.One word substitutes 4.Detecting errors

Course Outcomes:

On successful completion of course, the student will be able to		POS related to COS
CO1	Get Knowledge on behavioral aspects and Communicate effectively with others by using Indian words used in English.	PO1, PO10
CO2	Get Knowledge on the usage of proper usage of grammar in one's career development as a lifelong learning through communicating effectively.	PO1, PO10, PO12
CO3	Cultivate knowledge to confidence in one's life Skills	PO1, PO9
CO4	Get knowledge on the achievements made by the scientists on the earth by Life-Long Learning scientific articles from various journals present in the library and through motion pictures in internet.	PO1, PO12
CO5	Develop knowledge independently and life-long learning to protect environment and society from destruction.	PO1, PO6

Prescribed Book:

The text book prepared by the Department of English of SITAMS will be issued to students

References Books:

1.Business Communication and Soft Skills. K.Srinivasa Krishna and B. Kuberudu, 2008, Excel Books, New Delhi.

2.English for Technical Communication. K. R. Lakshmi Narayana, Scitech.

3.Spoken English, 2009, R. K. Bansal and J. B. Harrison, Edn, Orient Longman, Mumbai.

4.Speaking English Effectively,2/e, Krishna Mohan & NP Singh, Macmillan, New Delhi

5.A Practical Course in English Pronunciation,2004, J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.

6. Murphy's English Grammar by Raymond Murphy.

7. Cambridge English Dictionary for Advanced Learners (with CD)

CO-PO Mapping

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

I B.Tech II semester

L	T	P	C
3	1	0	3

16SAH122 MATHEMATICS – II
(Common to all Branches)

Course Educational Objectives:

CEO1: 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. .
CEO2: To learn the concepts of double and triple integrals and compute double and triple integrals
CEO3: To develop skill to design Sine and Cosine waves with the help of Fourier Series & Fourier Transforms.
CEO4: To learn the concepts of z-transformation and inverse z- Transforms and to explore solving difference equations by using z- transform method.

UNIT-1: MATRICES

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 – Diagonalization of a Matrix using Similarity Transformation only.

UNIT – 2: MULTIPLE INTEGRALS

Multiple Integrals: Double and Triple Integrals - Change of Variables - Change of Order of Integration.

UNIT – 3: FOURIER SERIES

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

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

Z-transforms - Properties - Damping Rule - Shifting Rule - Initial and Final Value Theorems - Inverse Z-Transform - Convolution Theorem - Solution of Difference Equations by Z-Transforms.

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 diagnolisation using eigen values and eigen vectors	PO1,PO2
CO2	Demonstrate knowledge in evaluating double and triple integrals	PO1,PO2
CO3	Develop analytical skills in evaluating the properties of functions through Fourier series	PO1,PO2
CO4	Develop analytical skills in evaluating the properties of functions through Fourier transform	PO1,PO2
CO5	Demonstrate knowledge in z-transform and inverse z- transform and develop analytical skills in solving problems involving difference equations using z-transformation	PO1,PO2,PO3

Text Books:

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

Reference Books:

1. Engineering Mathematics–I, T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand and Company Ltd, 2012, New Delhi.
2. Engineering Mathematics for JNTU, B.V. Ramana, Tata McGraw Hill Publishers, 2012, New Delhi.
3. Higher Engineering Mathematics, Dr. M. K. VenkataRamana, National Pub & Co, Madras.
4. A Text Book of Engineering Mathematics, N.P.Bali, Laxmipublications(P)Ltd, 2011, New Delhi.
5. Advanced Engineering Mathematics, Erwin Kreyszig, 8/e, Wiley India, 2009, 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	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-
CO*	3	3	3	-	-	-	-	-	-	-	-	-

I B.Tech II semester

L	T	P	C
3	1	0	3

16CSE121 DATA STRUCTURES
(Common to CSE, ECE & EEE)

Course Educational Objectives:

CEO1: To provide knowledge on Types of Data Structures.
CEO2: Todesign Linked List data structures and its applications.
CEO3: To implement Stack and Queue data structures and its applications.
CEO4: To analyze the Searching and Sorting techniques.
CEO5: To implement the Trees data structure.

UNIT -1: INTRODUCTION TO DATA STRUCTURES

Definition- Abstract Data Type- C Classification of Data Structures - Linear and Non Linear- Applications- Review of Arrays - Dynamic Memory Allocation and Deallocation.

UNIT -2: LINKED LISTS

Definition – Structure of Linked List - Singly Linked Lists- Circularly Linked Lists- Doubly Linked Lists – Applications of Linked Lists.

UNIT -3: STACKS AND QUEUES

Stacks: Definition–Structure and Operations of Stack–Array based Implementation–Linked ListImplementation – Applications of Stacks.

Queues: Definition–Structure and Operations of Queue–Array based Implementation–Linked ListImplementation – Double Ended Queues – Applications of Queues.

UNIT-4: SORTING AND SEARCHING TECHNIQUES

Sorting Techniques: Insertion sort - Selection sort - Bubble sort - Quick sort - Merge sort.

Searching Techniques: Linear search - Binary Search.

UNIT-5: TREES

Introduction to Trees - Definition – Basic Terminologies – Binary Tree – Types of Binary Trees – Tree Traversals – Binary Search Tree.

Course Outcomes:

On successful completion of the course, the student will be able to		POs related to COs
CO1	Knowledge on types of Data Structures	PO1, PO2,
CO2	Implement the Linked List data structures for storing the data	PO1, PO2, PO3
CO3	Implement the Stack and Queue data structures for processing the data	PO1, PO2, PO4
CO4	Use Searching and Sorting techniques in real time scenarios	PO1, PO2, PO4
CO5	Implement the Tree data structures for managing the data	PO1, PO2, PO3

Text Books:

1. Classic Data Structure by D. Samanta, Eastern Economy Edition.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education, 1997.

Reference Books:

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education, 2010, Chennai.
2. Programming in C and Data Structures, E.Balaguruswamy,2/e, Tata McGraw Hill, 2012,New Delhi.
3. Data Structures Using C, ReemaThareja, Oxford University Press, 2011.
4. Data Structures and Algorithms ,Aho, Hopcroft and Ullman Pearson Education,1983.

CO-PO Mapping

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

I B.Tech II semester

L	T	P/D	C
1	0	5	3

16 MEC111 ENGINEERING DRAWING
(Common to all Branches)

Course Educational Objectives:

CEO1: To expose them to existing national and international standards related to technical drawings.
CEO2: 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

Engineering Curves: Conics - Construction of ellipse, parabola and hyperbola by eccentricitymethod 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

Projection of Points: Principles of orthographic projection - Conventions - First angle projection andThird 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

Projection of Solids: Projection of simple solids like prisms, pyramids, cylinder and cone, when theaxis is inclined to one and both the principal planes. **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

Development of Surfaces: Development of lateral surfaces of simple and sectioned solids likeprisms, 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

Orthographic Projections: Principles and methods of orthographic projections - Plane of projections- Representation of three dimensional objects - Layout of views - Conversion of 3D objects to 2Dobjects.

Perspective Projection: Perspective projection of lines, planes and simple solids like prisms and pyramids by visual ray method.

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 and Sections of Solids like Prisms, Pyramids, Cylinder and 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, 50/e, Charotar Publishing House, 2010.
2. A Text book of Engineering Graphics, K.V.Natrajan, Dhanalakshmi Publishers, Chennai, 2009.

References Books:

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

CO-PO Mapping

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

I B.Tech II Semester

16EEE121	ELECTRICAL CIRCUITS	L	T	P/D	C
		3	1	0	3

Course Educational objectives:

CEO1: To impart knowledge on
- Fundamentals of electrical circuits
- Various combinations of electrical network
- Fundamental laws
- Determining the circuits parameters through mesh and nodal analysis

CEO2: To develop skill on analyzing different factors of various periodic waveforms and to

CEO3: To introduce phenomenon of
- Magnetically coupled Circuits
- Resonance Circuits

CEO4: To inculcate skill on investigating the DC electrical circuits through different network theorems.

CEO5: To inculcate skill on investigating the AC electrical circuits through different network theorems.

UNIT – 1: FUNDAMENDAL CONCEPTS OF ELECTRICAL CIRCUITS

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

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

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

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

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		POs related to COs
CO1	Analyse electrical circuits	PO1, PO2, PO3, PO4, PO5, PO12
CO2	Investigate different parameters in single phase AC circuits	PO1, PO2, PO3, PO4, PO12
CO3	Analyse the magnetically coupled circuits and evaluate the resonance condition for series and parallel RLC network.	PO1, PO2, PO3, PO4, PO12
CO4	Apply circuit theorems for DC circuits	PO1, PO2, PO3, PO4, PO5, PO12
CO5	Apply circuit theorems for AC circuits	PO1, PO2, PO3, PO4, PO5, PO12

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.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

CO-PO Mapping

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

I B.Tech II Semester

16EEE122	ELECTRICAL CIRCUITS LAB	L	T	P/D	C
		0	0	3	2

Course Educational Objectives:

CEO1: To gain practical experience on fundamental electric laws.

CEO2: To gain practical experience on verification of theorems.

CEO3: To evaluate the phase angle of RLC circuits practically.

CEO4: To introduce the practical approach on identifying the resonance circuits

CEO5: 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:

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

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
CO*	3	3	3	3	-	-	-	3	3	3	-	3

I B.Tech II semester

L	T	P	C
0	0	3	2

16CSE122 DATA STRUCTURES LAB
(Common to CSE, ECE&EEE)

Course Educational Objectives:

CEO1: To provide knowledge on flowchart and algorithm to the given problem

CEO2: To exercise the concepts of linked lists using C programs.

CEO3: To develop the skill of C programs using stacks and Queues.

CEO4: To understand C programs using searching and sorting techniques

CEO5: To exercise the tree traversal concepts in C

EXERCISE 1:

Write a C Program using Dynamic Memory Allocation.

EXERCISE 2:

Write a C Program that uses Functions to Perform the Following Operations on Singly Linked List.
i)Creation ii)Insertion iii)Deletion iv)Traversal

EXERCISE 3:

Write a C Program that uses Functions to Perform the Following Operations on Doubly Linked List.
i)Creation ii)Insertion iii)Deletion iv)Traversal

EXERCISE 4:

Write a C Program that Implement Stack Operations using Arrays.

EXERCISE 5:

Write a C Program that Implement Stack Operations using Linked List.

EXERCISE 6:

Write a C Program that uses Stack Operations to Perform the Following

i) Converting Infix Expression to Postfix Expression.
ii) Evaluating the Postfix Expression.

EXERCISE 7:

Write a C Program that Implement Queue Operations using Arrays.

EXERCISE 8:

Write a C Program that Implement Queue Operations using Linked List.

EXERCISE 9:

Write a C Program that Implement Dequeue Operations using Arrays.

EXERCISE 10:

Write a C Program that use both Recursive And Non Recursive Functions to Perform the Following Searching Operations for a Key Value in a Given List of Integers.

i)Linear Search ii)Binary Search

EXERCISE 11:

Write a C Program that Implements the Following Sorting Methods to Sort a Given List of Integers in Ascending Order.

i)Selection Sort ii)Bubble Sort

EXERCISE 12:

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

EXERCISE 13:

Write a C Program that uses Functions to Perform the Following Binary Tree Traversals

i) Inorder ii)Preorder iii)Postorder

EXERCISE 14:

Write a C Program to Implement the Binary Search Tree.

Course Outcomes:

On Successful completion of this course, the students will able to		**POs related to COs**
CO1	Design the algorithm and flowchart for the given problem.	PO1
CO2	Develop the programs on linked lists	PO2
CO3	Analyze the concepts on stacks and queues	PO3
CO4	Design the programs on searching and sorting.	PO4
CO5	Understand the concepts of tree traversals.	PO5
CO6	Following ethical principles in implementing various Data Structures.	PO8
CO7	Doing experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the Algorithms and Programs.	PO10
CO9	Continue updating their skill related to various data structures implementation for various application during their life time	PO12

Text Books:

1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education, 1997.
2. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education, 2010, Chennai.

Reference Books:

1. Programming in C and Data Structures, E.Balaguruswamy, 2/e, Tata McGraw Hill, 2012, New Delhi.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education, 1997.
3. Data Structures Using C, ReemaThareja, Oxford University Press, 2011.
4. Data Structures and Algorithms, Aho, Hopcroft and Ullman, Pearson Education,1983.

CO-PO Mapping

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

I B.Tech II semester

L	T	P	C
0	0	3	2

16SAH116 ENGLISH COMMUNICATION SKILLS (ECS) LAB
(Common to All Branches)

Course Educational Objectives:

CEO1: To enhance communication skills especially in listening, speaking with confidence, read variety of materials and to improve their writing skills effectively.

CEO2: To learn better pronunciation by using proper phonetic sounds with accurate word accent.

CEO3: To provide PowerPoint presentations, participation in Group Discussion and facing Interviews with confidence.

UNIT-I

1. Phonetic Sounds
2. Just a Minute

UNIT-II

3. Rules Regarding Stress
4. Listening Skills (TED Talks)

UNIT-III

5. Presentation Skills-Oral
6. Role Plays (Organizing Events in the College)

UNIT-IV

7. Book Review-Oral
8. Resume Writing

UNIT-V

9. Group Discussion Skills
10. Interview Skills

Minimum Requirements for ELCS Lab:

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided language lab for 60 students with 60 systems, one master console, LAN facility and English Language Software for self study learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. System, projector, a digital stereo-audio & video system and camcorder etc. System Requirement (Hardware component)

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

i) P-IV Processor-speed-2.8GHZ, RAM-512MB minimum, Hard Disk-80GB
ii) Headphones of High quality

Course Outcome:

On successful completion of the course, students will be able to		POs related to COs
CO1	Knowledge to communicate effectively using Phonetic sounds.	**PO1**
CO2	Knowledge in using Stress Rules of English While Communicating	**PO5**
CO3	Get Self Confidence in one's life by performing presentation skills and Role Plays	**PO8**
CO4	Make good presentations through writing one's Resume.	**PO10**
CO5	Get knowledge to participate in Team discussion to get Individual confidence.	**PO12**

References Books:

1. Everyday Dialogues in English, Robert J. Dixson, Prentice-Hall of India Ltd., New Delhi,2006.
2. Body Language - Your Success Mantra, Dr Shalini Verma, S.Chand & Co, New Delhi,2009.
3. A Handbook for English language Laboratories, ,E.Sureshkumar, P.Sreehari, Foundation Books, Cambridge University Press, Chennai,2009.

Suggested Software:

- Globarena software, Hyderabad
- Walden Software, Hyderabad
- English Pronouncing Dictionary, Daniel Jones 17/e with CD, CambridgeUniversity Press, New Delhi.
- DELTA's key to the Next Generation TOEFL Test, 6 audio CDS, 2007, New Age International Publishers, Critical Study, New Delhi.
- Oxford Advanced Learners' Dictionary with CD,8/e, 2010, Oxford.
- Cambridge Advanced Learners' English Dictionary with CD, 3/e, 2010.
- Murphy's English Grammar with CD, 2004, Cambridge.

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
CO*	**3**	**-**	**-**	**-**	**3**	-	**-**	**3**	**-**	**3**	**-**	**3**

II B.Tech I semester

L	T	P	C
3	1	0	3

16SAH211 MATHEMATICS – III
(Common to all Branches)

Course Educational Objectives:

CEO1: To develop skill to analyze 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

CEO2: To learn the method of evaluation of numerical derivative, numerical integration and to solve ordinary differential equations numerically using numerical methods

CEO3: 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

CEO4: 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: SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS AND INTERPOLATION

Solution of Algebraic and Transcendental Equations: Introduction - The Bisection Method - TheMethod 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: NUMERICAL DIFFERENTIATION, NUMERICAL INTEGRATION AND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS Numerical Differentiation, 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 -3: PARTIAL DIFFERENTIAL EQUATIONS

Formation of Partial Differential Equations by Elimination of Arbitrary Constants and Arbitrary Functions - Method of Separation of Variables.

UNIT - 4: VECTOR DIFFERENTIATION

Introduction to Vector Differentiation, Scalar and Vector Point Functions- Gradient of as Scalar Function - Divergence& Curl of a Vector Function and their Properties.

UNIT - 5: VECTOR INTEGRATION

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.

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate the knowledge in solving algebraic and transcendental equations by various mathematical methods and Design novel mathematical methods for constructing the interpolating polynomials to the given data	PO1,PO2
CO2	Demonstrate the knowledge in finding the numerical values to derivatives, 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
CO3	Develop analytical skills for the problems involving partial differential equations and the methods to solve them	PO1,PO2
CO4	Demonstrate the 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
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

Text Books:

1. Mathematical Methods, T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and
2. M.V.S.S.N. Prasad , S. Chand and Company Publishers, 2012, New Delhi.
3. Higher Engineering Mathematics, Dr. B. S. Grewal, 34/e, Khanna Publishers, 1999, Delhi.
4. Introductory Methods of Numerical Analysis, S SSastry, 4/e, 2005, PHI Publishers.

Reference Books:

1. Engineering Mathematics–I, T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand and Company Ltd, 2012, New Delhi.
2. Engineering Mathematics for JNTU, B.V. Ramana, Tata McGraw Hill Publishers, 2012, New Delhi
3. Advanced Engineering Mathematics, Erwin Kreyszig, 8/e, Wiley India, 2009, New Delhi.
4. Numerical Methods for Scientific and Engineering Computations, M K Jain , S R K Iyengar, R K Jain,4/e ,2004.
5. A Text Book of Engineering Mathematics, N.P.Bali, Laxmipublications(P)Ltd, 2011,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	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	-	-	-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
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II B.Tech I semester

L	T	P	C
3	1	0	3

16SAH212 ENVIRONMENTAL SCIENCE
(Common to All Branches)

Course Educational Objectives:

CEO1: To study the nature and facts about environment.

CEO2: To finding and implementing scientific, technological, economic and political solutions to environmental problems.

CEO3: To study the interrelationship between living organism and environment.

CEO4: To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

CEO5: To study the dynamic processes and understand the features of the earth's interior and surface

UNIT–1: INTRODUCTION TO ENVIRONMENTAL SCIENCE AND NATURAL RESOURCES

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

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

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 WithPesticideUse - Excess Salt and Water.

Solid Waste Management: Characteristics - Generation - Collection And Transportation Of SolidWastes - Engineered Systems For Solid Waste Management (Reuse, Recycle, Energy Recovery, Treatment And Disposal).

UNIT – 4: SOCIAL ISSUES AND THE ENVIRONMENT

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

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.

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on fundamentals of Environment. And Analyze the availability of non conventional energy resources.	PO1, PO2, PO6, PO7, PO8, PO9, PO12
CO2	Identify appropriate types of habitats in the surrounding and analyze the influence of habitats on survival.	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. **"**Textbook of Environmental Studies for Undergraduate Courses"2nd edition 2013, University grants commission

2. C.P.Kaushik and Anubha kaushik "Text book of environmental studies", 4th Edition, New age International publishers.

Reference Books:

3. Environmental studies – from crisis to cure, 2/e, 2012, R. Rajagopalan, Oxford University Press, New Delhi.
4. A Text book of environmental science and Technology, 1/e, 2008, Dr. M. Anji Reddy, B.S. Publications, Hyderabad.

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**

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

II B.Tech I semester

L	T	P	C
3	1	0	3

16EEE214 PRINCIPLES OF ELECTRICAL ENGINEERING

Course Educational Objectives:

CEO 1: To acquire the knowledge on DC and AC transients.
CEO 2: To impart the knowledge on two port networks.
CEO 3: To acquire the knowledge on filters and attenuators.
CEO 4: To attain the knowledge on D.C. machines.
CEO 5: To acquire the knowledge on transformers and single phase ac machine.

UNIT I- TRANSIENT ANALYSIS

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 II -TWO PORT NETWORKS

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 III –FILTERS & SYMMETRICAL ATTENUATORS

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-IV- DC MACHINES

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-V-TRANSFORMERS AND SINGLE PHASE AC MACHINE

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.

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Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on DC 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

TEXT 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, Shyammohan S.palli, 3rd edition, 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	-	-	-	-	-	-	-

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

II B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE 211 ELECTRONIC DEVICES AND CIRCUITS
(Common to ECE, EEE)

Course Educational Objectives:

CEO1: To provide knowledge and overview of semiconductor materials to illustrate the function of basic electronic devices.
CEO2: To develop skills to design regulated power supply by using the concept of diodes and its applications.
CEO3: To learn the concept of different transistor configurations and biasing methods.
CEO4: To understand the basic construction and operation of field effect transistor.
CEO5: To classify and describe the different semiconductor devices for special applications

UNIT -1: JUNCTION DIODES AND CHARACTERISTICS

PN Diode construction and operation-PN Diode Equation-Volt-Ampere (V-I) Characteristics-Temperature Dependence of V-I Characteristics-Ideal Versus Practical Static and Dynamic Resistances-Diode Equivalent circuits-Break down Mechanisms in semiconductor Diodes-Zener Diode Characteristics.

UNIT-2: APPLICATIONS OF PN JUNCTION DIODE

PN Junction as a Rectifier-Half wave rectifier-ripple factor-full wave rectifier-Bridge Rectifier-Harmonic components in a rectifier circuit-Inductor filter-Capacitor filter-L- section filter-π- section filter & Use of Zener Diode as a Regulator.

UNIT -3: TRANSISTOR CHARECTERISTICS

Transistor construction-BJT Operation-BJT Symbol-Transistor as an Amplifier-Common Emitter-Common Base and Common Collector Configurations and its characteristics-Transistor Biasing-Feedback bias & Voltage divider bias-Hybrid model for BJT.

UNIT -4: FET CHARECTERISTICS

The Junction Field Effect Transistor (Construction, Principle of Operation, Symbol) - Pinch-Off Voltage – Volt-Ampere Characteristics-FET as Voltage Variable Resistor-Comparison between BJT and FET-MOSFET- Basic Concepts-Construction-modes (depletion & enhancement)-symbol-principle of operation-characteristics-FET Biasing-Feed back bias & Voltage divder bias-Hybrid model for FET.

UNIT -5: SPECIAL PURPOSE ELECTRONIC DEVICES

Tunnel Diode-Varactor Diode-Schottky Barrier Diode-Silicon Control Rectifier-Diac-Triac-LDR-LED-Photo diodes & LCD-Uni-Junction Transistor (UJT)-Photo transistors.

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

COURSE OUTCOMES:

On successful completion of course the students will be able to		**POs related to COs**
CO1	Demonstrate Knowledge on construction and analysis of PN Junction diode, Zener diode with their VI Characteristics.	PO1,PO2
CO2	Design and analysis of various rectifiers and filter circuits	PO1, PO2, PO3.
CO3	Demonstrate knowledge on Construction and Analysis of BJT and its characteristics with various Biasing techniques.	PO1, PO2,PO3,PO4
CO4	Demonstrate knowledge on Construction and Analysis of FET and its characteristics with various Biasing techniques.	PO1, PO2,PO3,PO4
CO5	Demonstrate **knowledge** on special purpose electronic devices, **analyze** the construction & operation of devices.	PO1, PO2

TEXT BOOKS:

1. Electronic Devices and Circuits, J.Millman and Christos.C.Halkias, Satyabrata, 3/e, TMH, 2012.
2. Electronic Devices and Circuits, K .Lalkishore, 2/e, BSP, 2005.

REFERENCE BOOKS:

1. Introductory Circuit Analysis, R.L. Boylestad,12/e, Pearson, 2013.
2. Electronic Devices and Circuits, David A. Bell, 5/e, Oxford University press, 2008.
3. Microelectronic Circuits, A. S. Sedra and K. C. Smith, 5/e, Oxford University Press.

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	3	2	-	-	-	-	-	-	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-		-	-	-	-	-	-
CO*	3	2.8	2.66	2	-		-	-	-	-	-	-

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

II B.Tech I semester

L	T	P	C
3	1	0	3

16ECE 212 SIGNALS & SYSTEMS

Course Educational Objectives:

CEO1: To introduce the concepts and techniques associated with the understanding of signals and systems.

CEO2: To familiarize the concepts of transform based, continuous time and discrete time analysis of signals and systems

CEO3: To provide fundamental knowledge about sampling process

CEO4: The concept of convolution is useful for analysis in the areas of linear systems and communication theory.

CEO5: 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 AND SYSTEMS

Continuous-Time and Discrete-Time Signals-Transformations of the Independent Variable-Exponential and Sinusoidal Signals-The Unit Impulse and Unit Step Functions-Continuous-Time and Discrete-Time Systems-Basic System Properties-Linear Time-Invariant Systems - Discrete-Time LTI Systems-The Convolution Sum-Continuous-Time LTI Systems – The Convolution Integral-Properties of Linear Time-Invariant Systems-Causal LTI Systems Described by Differential and Difference Equations-Singularity Functions.

UNIT- 2: FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS

The Response of LTI Systems to Complex Exponentials-Fourier Series Representation of Continuous-Time Periodic Signals-Convergence of the Fourier Series-Properties of Continuous-Time Fourier Series-Fourier Series Representation of Discrete-Time Periodic Signals-Properties of Discrete-Time Fourier Series.

UNIT- 3: THE CONTINUOUS-TIME FOURIER TRANSFORM

Representation of Aperiodic Signals-The Continuous- Time Fourier Transform-The Fourier Transform for Periodic Signals-Properties of the Continuous- Time Fourier Transform, The Convolution Property, Fourier Properties and Basic Fourier Transform Pairs-Systems characterized by Linear constant coefficient differential equations-The Discrete-Time Fourier Transform - Representation of Aperiodic Signals-The Discrete-Time Fourier Transform-The Convolution Property-Fourier Transform Properties and Basic Fourier Transform Pairs-Duality-Systems Characterized by Linear Constant-Coefficient Difference Equations.

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UNIT-4: TIME & FREQUENCY CHARACTERIZATION OF SIGNALS AND SYSTEMS

The Magnitude-Phase Representation of the Fourier Transform-The Magnitude-Phase Representation of the Frequency Response of LTI Systems-Signal Bandwidth-System Bandwidth.

Sampling: Representation of a Continuous-Time Signal by Its Samples - Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation-Effect of under sampling: Aliasing, Discrete-Time Processing of Continuous-Time Signals.

UNIT -5: LAPLACE AND Z-TRANSFORMS

The Laplace Transform. The Region of Convergence for Laplace Transforms& Properties-The Inverse Laplace Transform-Properties of the Laplace Transform-Some Laplace Transform Pairs-The Z-Transform - Region of Convergence for the z-Transform & Properties-The Inverse z-Transform-Properties of the z-Transform-Some Common z-Transform Pairs.

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	Analyze the frequency components of signals using Fourier series and demonstrate knowledge on properties and usage of Fourier series in both continuous and discrete form.	**PO1,PO2**
CO3	Analyze frequency components of signals using Fourier transform and demonstrate knowledge on properties and usage of Fourier transform in both continuous and discrete form.	**PO1,PO2,PO4**
CO4	Analyze time and frequency characteristics of signals and systems and demonstrate knowledge on sampling process.	**PO1,PO2,PO4**
CO5	Demonstrate knowledge on Laplace and Z transform analyze the system characteristics	**PO1,PO2,PO4**

Text books

1. Signals and systems, A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2/e, Pearson Education, Delhi, 1997.
2. Signals & System, Simon Haykin and Van Veen,2/e, John Wiley & Sons, inc, Delhi, 2001.

Reference books:

1. Signals, Systems & Communications, B.P Lathi, 2/e, BS Publications, Hyderabad,2003.
2. Signals and Systems using MATLAB, Luis F. Chaparro, Academic Press, 2011.
3. Fundamentals of Signals and Systems, Michel J. Robert, International Edition, Tata McGraw-Hill, Delhi,2008.

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	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	2	-	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-
CO*	3	3	-	2	-	-	-	-	-	-	-	-

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(AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I semester

L	T	P	C
3	1	0	3

16ECE 213 SWITCHING THEORY AND LOGIC DESIGN
(Common to ECE & EEE)

Course Educational Objectives:

CEO1:To familiarize the students with different number systems, conversions, digital logic, simplification and minimization of Boolean functions.
CEO2:To design combinational & sequential digital circuits and state machines.
CEO3:To introduce programmable logic devices.

UNIT - 1: NUMBER SYSTEMS& CODES

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

Minimization of Switching Functions Using K-Map Up to 5 variables-Tabular Minimization (Quine-Mcluskey)- Minimal SOP And POS Realization-Problem Solving Using K-Map for Boolean Functions in SOP and POS Forms.

UNIT - 3: COMBINATIONAL LOGIC CIRCUITS & PLDs

Combinational Logic Circuits: 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- Priority Encoder – Multiplexer – De multiplexer – Code converters .

PLD's:PROM – PLA – PAL ,Realization of Switching Functions Using PROM - PLA and PAL - Comparison of PROM, PLA, and PAL.

UNIT - 4: SEQUENTIAL CIRCUITS I

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

Design of Synchronous and Asynchronous Counters.

UNIT - 5: SEQUENTIAL CIRCUITS II

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

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Course Outcomes:

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, 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 charts.	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	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	.-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-
CO*	3	2.8	2.3	3	-	-	-	-	-	-	-	-

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I semester

L	T	P	C
0	0	3	2

16ECE 214 ELECTRONIC DEVICES AND CIRCUITS LAB

COURSE EDUCATIONAL OBJECTIVES:

CEO1: To identify & test the electronic components which are used to design electronic circuits.

CEO2: To provides practical knowledge on basic semiconductor devices and test its functionalities.

CEO3: To develop skills on semiconductor devices and obtain characteristics practically.

CEO4: To test the active components and obtain their characteristics practically.

CEO5: To develop and design the electronic circuits by soldering.

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.

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COURSE OUTCOMES:

On successful completion of course the students will be able to		POs related to COs
CO1	Demonstrate knowledge on identification and testing of passive components along with active devices.	**PO1**
CO2	Analyze the VI characteristics of diodes and obtain the practical observations	**PO2**
CO3	Design the basic electronic circuits by soldering with specifications	**PO3**
CO4	Analyze the VI characteristics of transistor and FET devices and obtain the practical observations	**PO4**
CO5	Follow ethical principles on analysis of different electronic circuits which is used for project works..	**PO8**
CO6	Do experiments effectively as an individual and as a member in a group	**PO9**
CO7	Communicate verbally and in written form, the understanding about the experiments	**PO10**
CO8	Continue updating their skill related to electronic devices and their applications during their life time.	**PO12**

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

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**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

.II B.Tech I semester	L	T	P	C
	0	0	3	2

16EEE215 PRINCIPLES OF ELECTRICAL ENGINEERING LAB

Course Educational Objectives:

CEO1: To gain practical experience on fundamental RL and RC circuits.

CEO2: To gain practical experience on different two port networks.

CEO3: To evaluate the performance characteristics of DC shunt generator

CEO4: To evaluate the efficiency of DC shunt machine

CEO5: To evaluate the performance characteristics and speed control of DC shunt motor

Any Ten of the Following

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 TRANSFORMER TO FIND THE EFFECIENCY.
11. REGULATION OF SINGLE- PHASE TRANSFORMER.
12. SPEED CONTROL OF DC MOTOR.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course outcomes:

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

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**
CO12	-	-	-	-	-	-	-	-	-	-	-	-

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

II B.Tech I Semester

L	T	P	C
2	-	-	-

16AUD211 PROFESSIONAL ETHICS
(Common to ALL Branches)

Course Educational Objectives:

CEO1: To develop the human values in work place, society and every where.
CEO2: To understand the importance of engineering ethics with the mentors' theory on ethics
CEO3: To inculcate codes of ethical values to the engineers in the society
CEO4: To understand the ethical issues on safety, responsibilities and human rights in society.
CEO5: To know the ethics issues on environmental, weapons, computers ethics & Moral leaderships.

UNIT - 1: Human Values

Morals, values and ethics – Integrity – Work Ethic –Honesty – courage – Empathy – Self-confidence – Character.

UNIT - 2: Engineering Ethics

Senses of 'Engineering Ethics' – Variety of moral issued – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and controversy – Models of professional roles – Theories about right action – Self-interest – Customs and religion – Uses of ethical theories – Valuing time – Co-operation – Commitment.

UNIT - 3: Engineering as Social Experimentation

Engineers as responsible experimenters – Codes of ethics – A balanced outlook on law – The challenger case study.

UNIT - 4: Safety, Responsibility and Rights

Safety and risk – Assessment of safety and risk – Risk benefit analysis – The Three Mile Island and Chernobyl case studies.

UNIT - 5: Global Issues

Multinational corporations – Environmental ethics - Computer ethics – Weapons development – Engineers as managers – Engineers as expert witnesses and advisors – Moral leadership.

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(AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

After the completion of this course, a successful student is able to		POs related to COs
CO1	Develop the human values in work place, society and everywhere.	PO6,PO8,PO9, PO11,PO12
CO2	Understand the importance of engineering ethics with the mentors' theory on ethics	PO6,PO8,PO9, PO11,PO12
CO3	Inculcate codes of ethical values to the engineers in the society	PO6,PO8, PO12
CO4	Understand the ethical issues on safety, responsibilities and human rights in society.	PO6,PO8,PO9, PO12
CO5	Know the ethics issues on environmental, weapons, computers ethics & Moral leaderships	PO6,PO7,PO8,PO9

Text books:

1. A Textbook on Professional Ethics and Human Values, 1/e, 2006, Naagarazan R.S., New Age International (P) Ltd, Publishers, New Delhi.
2. Professional Ethics and Human Values, S. Dinesh Babu, Laxmi Publications (P) Ltd, New Delhi.

Reference books:

1. Engineering Ethics, 2004, M. Govindarajan, S. Natarajan, V.S.Senthil Kumar, Prentice - Hall of India, Pvt. Ltd., New Delhi.
2. Engineering Ethics, 2004, Charles D. Fleddermann, Pearson Education/ Prentice- Hall, New Jersey (Indian reprint now available).
3. Engineering Ethics- Concepts and Cases, 2000, Charles E Harris, Michael S. Protchard and Michael J Rabins, Wadsworth Thompson Leaning, United States (Indian reprint now available).
4. Ethics in Engineering, Mike Martine and Roland Schinzinger, Tata McGraw- Hill Education, Pvt. Ltd.,Noida.
5. Ethics and the Conduct of Business, 2003, John R Boatright, Pearson Education, New Delhi.
1. Fundamentals of Ethics for Scientists and Engineers, 2001, Edmund G Seebauer and Robert L Barry, Oxford University press, Oxford.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	_	_	_	_	_	2	-	3	2	-	1	2
CO.2	_	_	_	_	_	2	-	3	2	-	1	2
CO.3	_	_	_	_	_	3	-	3	-	-	-	2
CO.4	_	_	_	_	_	2	-	3	2	-	-	2
CO.5	_	_	_	_	_	2	2	3	2	-	-	-
CO*	_	_	_	_	_	2.2	2	3	2	**-**	**1**	2

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

II B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16SAH221 MATHEMATICS-IV
(Common to ECE& EEE)

Course Educational Objectives:

CE01: The course is designed to equip the students with the necessary mathematical skills and Techniques that are essential for an engineering course.

CEO2: To provide knowledge on

- Gamma ,Beta functions and complex functions in single variable
- Continuity, differentiability and properties of complex functions
- Integral of complex function and its applications
- Mapping of complex functions

CEO3: To learn Gamma and Beta functions, their properties and applications will be Introduced

CEO4: To analyze the functions of complex variable with a review of elementary complex functions and to learn continuity, differentiability and analyticity of a complex function

CEO5: To learn complex integration and to understand the Taylor and Laurent expansion with their use in finding out the residue and improper integral

CEO6: To learn conformal mapping of complex functions

UNIT - 1: Special Functions

Beta and gamma functions - Properties - Evaluation of integrals (simple examples). Bessel Function - Generating function (without proof) - Recurrence Relations - Orthogonality.

UNIT - 2: Complex Functions

Functions of a complex variable - Elementary functions: Exponential - Trigonometric - Hyperbolic - Logarithmic functions and their properties - Principal value - Continuity - Differentiability - Analyticity – Properties - Cauchy-Riemann equations in cartesian and polar coordinates - Harmonic and conjugate harmonic functions - Milne-Thompson method.

UNIT - 3: Complex Integration and Complex Power Series

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 - 4: Residue Calculus

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) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

UNIT - 5: Argument Principle, Rouche's Theorem its applications and conformal mapping

Argument Principle, Rouche's Theorem its applications: Argument principle - Rouche's theorem - Determination of number of zeros of complex polynomials - Maximum modulus principle - Fundamental theorem of algebra - Liouville's theorem.

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

Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate the knowledge in Gamma, Beta functions and develop analytical skills in providing solutions for problems involving real integrals using Gamma ad Beta functions	PO1,PO2
CO2	Demonstrate the knowledge in theory of functions of one complex variable ,continuity and differentiability of a complex function and write Cauchy-Riemann equations to describe the analyticity of complex functions	PO1,PO2
CO3	Demonstrate the 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
CO4	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
CO5	Demonstrate the knowledge in conformal mappings and bilinear transformations and develop skills in analyzing the properties exhibited by complex functions in Argand plane	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, New 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. Venkata Ramana, National Pub & Co, Madras.
4. A Text Book of Engineering Mathematics, 2011, N.P.Bali, Laxmi publications(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	-	-	-	-	-	-	-	-	-	-

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

II B.Tech II Semester

L	T	P	C
3	1	0	3

16MBA218 BUSINESS MANAGEMENT
(Common to all Branches)

Course Educational Objectives:

- The Objective of the course is to give a basic perspective of Management theories and practices.
- This will form foundation to study other functional areas of management.

UNIT - 1: BUSINESS ECONOMICS

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

Cost concepts - Production Function - Laws of Returns- Production Management-Plant Layout - Basic concepts of MIS and ERP- Total Quality Management (TQM), Six Sigma, Business Process Re-Engineering.

UNIT – 3: BUSINESS ORGANISATION AND MANAGEMENT

Features of Business, Types of Business Organizations: Sole proprietorship, Partnership, Joint Stock Company, and Public enterprises.

Management:Nature, significance and functions of Management.

UNIT – 4: HR AND MARKETING

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: FINANCIAL MANAGEMENT

Objectives and Functions of Financial Management - Sources of Long-term and Short-Term Finance - Capital Budgeting Techniques (Payback Period Method, ARR, NPV, IRR).

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Course Outcomes:

On successful completion of the course the student will be 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	PO2,PO5,PO7,PO9,PO12

Text Books:

1. Managerial Economics and Financial Analysis, Dr.A.R.Aryasri, 4/e, , TMH, New Delhi,2011
2. Management Science, Dr. G. Sreenivasa Rao,1/e, High tech Publishers, Hyderabad, 2009.
3. Management Science, A.R.Aryasri, 3/e, TMH, New Delhi, 2008.
4. Introduction to Management Science, P.Vijaykumar, Cengage Learning India,1/e, New Delhi.

Reference Books:

1. Managerial Economics, Analysis, Problems and Cases, P.L.Mehta, Sultan Chand & Sons, 17/e, New Delhi,2011.
2. Marketing Management, RajanSaxena, 4/e, TMH, New Delhi, 2010.
3. Personnel and Human Resource Management, SubbaRao, HPIL,2009.
4. Financial Management, I.M. Pandey, Vikas Publishers, Hyderabad,2011.
5. Entrepreneurship Development, S.S.Khanka, S.Chand and Company Limited, New Delhi,2009.

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	-	1	-	-	2	-	2	-	2	-	-	2
CO*	-	1.5	2	2	2	-	2	-	2	-	-	2

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

II B.Tech II Semester

L	T	P	C
3	1	0	3

16ECE221 ELECTRONIC CIRCUIT ANALYSIS

Course Educational Objectives:

CEO1: To develop the basic understanding of Small signal amplifiers and its analysis using hybrid model.
CEO2: To make the students to learn about Multistage Amplifiers and its analysis.
CEO3: To make students aware of amplifier operation at low and high frequency and its Frequency responses
CEO4: To make students learn about different types of feedback amplifiers and oscillators
CEO5 : To Analyse the power efficiency calculations of power amplifiers and to make Students learn about different types of Tuned amplifiers

UNIT-1:SMALL SIGNAL ANALYSIS OF AMPLIFIERS (BJT & FET)
BJT Modeling using h-parameters-Determination of h-Parameters from Transistor Characteristics-Measurement of h-Parameters-Analysis of CE- CB and CC configurations using h-Parameters-Comparison of CB-CE and CC configurations- Simplified Hybrid Model- Millers Theorem- Dual of Millers Theorem-Small Signal Model of JFET & MOSFET-Small signal analysis of Common Source and Common Drain Amplifiers using FET.

UNIT-2:MULTISTAGE AMPLIFIERS
Classification of Amplifiers- Distortion in amplifiers-Analysis of CE amplifier with Emitter Resistance and Emitter follower-Different Coupling Schemes used in Amplifiers- RC Coupled Amplifier- Direct and Transformer Coupled Amplifiers- Design of Single stage RC Coupled Amplifier Using BJT- Analysis of Cascaded RC Coupled BJT Amplifiers- Darlington Pair-Cascade Amplifier.

UNIT -3:FREQUENCY RESPONSE
Logarithms-Decibels- General Frequency considerations-Frequency Response of BJT Amplifier-Analysis at Low and High Frequencies- Effect of Coupling and bypass Capacitors- The Hybrid-pi (π)-Common Emitter Transistor Model-CE short Circuit Current gain- Current gain with Resistive Load-Single Stage CE Transistor Amplifier response- Gain-Bandwidth Product-Emitter follower at higher frequencies.

UNIT -4:ANALYSIS AND DESIGN OF FEEDBACK AMPLIFIERS AND OSCILLATORS
Concepts of Feedback-Classification of Feedback Amplifiers-General Characteristics of Negative Feedback Amplifiers- Effect of Feedback on Amplifier characteristics-Voltage Series-Voltage Shunt-Current Series and Current Shunt Feedback Configurations-Illustrative design Problems.
Conditions for Oscillations-RC and LC type Oscillators- RC-Phase shift and Wien-Bridge Oscillators-Generalized Analysis of LC Oscillators-Hartley and Colpitts Oscillators-Crystal Oscillators-Frequency and Amplitude Stability of Oscillators.

UNIT-5:POWER AND TUNED AMPLIFIERS
Classification-Series fed Class A Power Amplifier-Transformer Coupled Class A Amplifier- Efficiency-Push Pull Amplifier- Complementary Symmetry Class-B Power Amplifier-Amplifier Distortion-Power Transistor Heat sinking-Class C and Class D Power amplifiers.
Tuned Amplifier: Introduction- Q-Factor- Small Signal Tuned Amplifiers-Effect of Cascading Single Tuned Amplifiers on Bandwidth- Effect of Cascading Double Tuned Amplifiers on Bandwidth-Stagger Tuned Amplifiers- Stability of Tuned Amplifiers.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Explain classification of amplifiers and Analyze BJT amplifiers using small signal hybrid model and derive the voltage gain, current gain, input impedance and output impedance. Understand the concepts MOS amplifier	PO1,PO2,PO4
CO2	Design and Analyze the cascaded RC coupled BJT amplifier and different types of the coupled amplifiers	PO1,PO2, PO3,PO4
CO3	Analyze single stage amplifiers and their frequency response, its gain band width product and effect of coupling and bypass capacitors in amplifiers	PO1,PO2, PO4
CO4	Analyze and design the different types of feedback amplifiers, Explain the condition for oscillations in oscillators, Analyze different types of oscillators.	PO1,PO2, PO3,PO4
CO5	Analyze different types of power amplifiers and compare them in terms of efficiency. Analyze the effects of cascading on single, double tuned amplifiers on bandwidth and explain their stability.	PO1,PO2, PO4

Text Books:

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

References :

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, Mc Graw Hill.

CO-PO Mapping

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

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II B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE222 PULSE AND DIGITAL CIRCUITS

Course Educational Objectives:

CEO1: To provide knowledge on linear and nonlinear network responses for different signals

CEO2: To develop a skill on analysis and design of different switching devices and multi-vibrators

CEO3: To provide knowledge on different time base generators and its applications

CEO4: To provide knowledge on designing different logic gates using different logics

CEO5: To develop skill to analyze different logic characteristics on different logic families

UNIT - 1: LINEAR &NON LINEAR WAVESHAPING

High pass- low pass RC circuits- their response for sinusoidal- step- pulse- square and ramp inputs. RC network as differentiator and integrator- attenuators- its applications in CRO probe- RL and RLC circuits. Diode clippers- Transistor clippers- clipping at two independent levels- Transfer characteristics of clippers - Comparators- applications of voltage comparators- clamping operation and its characteristics- Clamping circuit theorem.

UNIT - 2: SWITCHING CHARACTERISTICS OF DEVICES & MULTIVIBRATORS

Diode as a switch- Diode Switching times- Transistor as a switch- transistor-switching times- Design of transistor switch.

MULTIVIBRATORS : Analysis and Design of Astable Multivibrator- Monostable- Bistable and Schmitt trigger using transistors-Triggering methods.

UNIT - 3: TIME BASE GENERATORS

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:REALIZATION OF LOGIC GATES

The Basic Gates- OR gate- AND gate- Universal Gates- NAND gate- NOR gate- Pulsed operation of Logic gates.

UNIT - 5: LOGIC FAMILIES

Digital IC specifications, Transistor-Transistor logic, Integrated injection Logic,Emitter coupled Logic,Metal oxide semi conductor Logic, Complementary metal oxide semiconductor logic, Dynamic MOS logic**.**

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Analyse different linear and non linear networks for different input signals	PO1, PO2,PO3
CO2	Demonstrate design knowledge on diode , transistor switching and multivibrators	PO1, PO2, PO3
CO3	Able to Identify appropriate time base generator circuit based on application	PO1, PO2, PO3
CO4	Understand the concept of designing different digital logic circuits	PO1, PO2, PO3
CO5	Analysis the different logic families with different characteristics of logic gates	PO1, PO2, PO3

TEXT BOOKS :

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

REFERENCES BOOKS:

1. Pulse and Digital Circuits , A. Anand Kumar, 2 /e, PHI,New Delhi.2009
2. Pulse and Digital Circuits, U.A Bakshi,A.P.Godse, 1/e ,Technical Publications,Pune,2011.

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	2	2	3	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	2.8	2.6	2.4	-	-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
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II Year B.Tech. II semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE223 PROBABILITY THEORY & STOCHASTIC PROCESS

Course Educational Objectives:

- 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.
- To introduce students to the basic methodology of "probabilistic thinking" and to apply it to problems;
- 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

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

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:

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

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

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.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate the concept of probability space, Understand the axiomatic formulation of modern Probability Theory.	PO1, PO2
CO2	Characterize probability models and to identify a distribution of a random variable by its characteristic function. Representation of random variables based on single random variable and Transformations.	PO1,PO2
CO3	Evaluate and apply moments using probability characteristic function and understand the concept of inequalities and probabilistic limits representation of multiples random variables. To compute a cumulative distribution function, a density function of a two dimensional random variable and a similar characteristics of marginal distribution.	PO1, PO2, PO4
CO4	Understand the concepts of Stochastic process and its classification such as wide sense & ergodocity random process. Determine the cross correlation and auto correlation. Understand the relation between auto correlation and cross correlation.	PO1, PO2
CO5	Determine the spectral density of stationary random processes. Demonstrate the response of LTI systems for statistical parameters.	PO1, PO2

TEXT BOOKS:

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

REFERENCE:

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	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	-	2	-	-	-	-	-	-	-	-

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE224 ELECTROMAGNETIC THEORY

Course Educational objectives:

CEO1: Analyze and solve the problems of electric fields that vary with three dimensional spatial co-ordinates as well as with time.

CEO2: Analyze the convection, conventional currents, Poisson and Laplace equations. Design various capacitor models.

CEO3: Analyze and solve the problems of magnetic fields that vary with dimensional spatial co-ordinates as well as with time.

CEO4: Get the knowledge and ability to apply the Maxwell's Equations to various field waves and at different boundaries.

CEO5: Understand and analyze the propagation of electromagnetic waves in different media.

UNIT -1: ELECTROSTATICS

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 - 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.

UNIT -2: MAGNETOSTATICS

Biot-Savart Law - Ampere's Circuital Law and Applications - Magnetic Flux Density - Maxwell's Two Equations for Magneto static Fields.

UNIT-3: 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.

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

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.

UNIT -5: EM WAVE PROPAGATION

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.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	**Demonstrate** and **Analyze** different co-ordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory as they are functions of space and time. Apply different techniques of vector calculus to understand different concepts of electromagnetic field theory.	PO1, PO2, PO4
CO2	**Analyze** fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields (Field intensity, Flux density etc.) in different media using the fundamental laws.	PO1, PO2
CO3	**Determine** the force exerted on magnetic fields and magnetization of charged particles. Working principle of current elements in magnetic fields and energy storage devices.	PO1, PO2
CO4	**Design** electromagnetic fields in time varying (Maxwell's equations) conditions with reference to boundary conditions.	PO1, PO2, PO3, PO4
CO5	**Knowledge** and **analyze** the concepts of electromagnetic waves, means of transporting energy or information, in the form of radio waves	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	-	3	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO*	2.8	2.6	2	2.5	-	-	-	-	-	-	-	-

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II B.Tech II Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

16ECE225 ELECTRONIC CIRCUIT ANALYSIS LAB

Course Educational Objectives:

CEO1: Obtain the frequency response of amplifiers with and without feedback
CEO2: Understand the design considerations of amplifiers with and without feedback
CEO3: Understand the design considerations of oscillators namely, RC phase shift and LC oscillators for a given frequency of oscillations
CEO4: Understand the conversion efficiency of large signal amplifiers, Class A and Class B.
CEO5 : Understand the design considerations of single tuned amplifiers
.

I) Design and Simulation in Simulation Laboratory using Any Simulation Software.
(Minimum of 6 Experiments):

1. Common Emitter Amplifier
2. Common Source Amplifier
3. A Two Stage RC Coupled Amplifier.
4. Current shunt and Voltage Series Feedback Amplifier
5. Cascade Amplifier
6. Hartley and Colpitts Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistors
8. Class A Power Amplifier (Transformer less)
9. Class B Complementary Symmetry Amplifier
10. High Frequency Common base (BJT) / Common gate (JFET) Amplifier.

II) Testing in the Hardware Laboratory

1. Common Emitter Amplifier
2. Common Source Amplifier
3. Class A Power Amplifier (with transformer load)
4. Class C Power Amplifier
5. Single Tuned Voltage Amplifier
6. Hartley andColpitts Oscillators.
7. RC Phase Shift Oscillator using Transistors
8. Darlington Pair.
9. MOSFET Amplifier

Equipments required for Laboratories:

For software simulation of Electronic circuits

Computer Systems with latest specifications.
Connected in LAN (Optional).
Operating System (Windows XP).
Suitable Simulations Software.

For Hardware simulations of Electronic Circuits

Regulated Power Supply (0-30V)
CRO's
Functions Generators.
Multimeters and Components.

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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	Use Multisim simulation package tool and to implement and simulate 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

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**

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II B.Tech II Semester

L	T	P	C
0	0	3	2

16ECE226 PULSE AND DIGITAL CIRCUITS LAB

Course Educational Objectives

CE01: To provide knowledge on responses of different circuits for various input signals
CE02: To develop a design skill on transistor switch
CE03: To provide a design knowledge and analysis of different multi-vibrators and Schmitt trigger
CE04: To in inculcate design skill on different sweep circuits
CE05: To develop skill on different logic gates with different logics.

List of Experiments:

1. Linear wave shaping- Differentiator and Integrator
2. Non Linear Wave Shaping – Clippers & clampers.
3. Transistor as a switch
4. Astable Multivibrator
5. Monostable Multivibrator
6. Bistable Multivibrator
7. Schmitt Trigger
8. UJT relaxation oscillator
9. Boot strap sweep circuit
10. Verify the truth table of universal gates by using DTL

Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate knowledge on linear and non linear and multivibrator circuits	PO1
CO2	Analyze the behavior of linear, non linear and multivibrator circuits	PO2
CO3	Design and develop linear,non linear and multivibrator circuits	PO3
CO4	Investigate and test the behavior of linear, non linear and multivibrator circuits	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

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

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**

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

II B.Tech II Semester **L T P C**

2 - - 1

16ECE227 ONLINE COMPREHENSIVE TEST-I

As per the Regulation 2016, There shall be two comprehensive online examinations will be conducted. One at the end of II year II Semester and the other at the end of III year, II semester, It has 100 objective questions for 100 marks on the subjects studied in the respective semesters.

A student shall acquire 1 credit assigned to the comprehensive online examination only when he/she secures 40% or more marks. In case, if a student fails in comprehensive online examination, he shall reappear at the next supplementary examination when offered.

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

16ECE311 ANALOG COMMUNICATIONS

Course Educational Objectives:

CEO1: To provide knowledge on
- Principle of basic communication system
- Modulation in time & frequency domain
- Generation and degeration of Amplitude Modulation

CEO2: To develop skills and describe different types of amplitude modulation schemes.
- Evaluate analog modulated waveforms time/frequency domain and also calculation of power.

CEO3: To introduce the concepts of angle modulations and their spectral characteristics.

CEO4: To understand the concepts of Multiplexing & pulse modulation schemes,
- Introduce the techniques of transmitters and receivers

CEO5: 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

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

DSB: Time domain and Frequency domain description, Power relations, Generation of DSB- Balanced modulator, Ring modulator, Detection of DSB: Coherent detection, Costas loop, Envelope detection.

SSB: Time domain and Frequency domain description, Power relations, Generation of SSB Phase descrption, Frequency Discrimination method, Demodulation of SSB.

VSB: Generation of VSB:Phase & Frequency Discrimination method, Demodulation of VSB and Applications.

UNIT – 3: ANGLE MODULATION

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

UNIT - 4 : TRANSMITTERS & RECEIVERS

Frequency Division Multliplexing (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

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

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 amplitude modulation and understand the different type of modulation and demodulation.	PO1, PO2.
CO2	**Analyze** the different types of amplitude modulation schemes with AM, **formulate** the power relations of DSB, SSB 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 modulation systems.	PO1, PO2,PO4
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	-	2	-	-	-	-	-	-	-	-
CO5	3	3	-	3	-	-	-	-	-	-	-	-
CO*	3	2.6	3	2.5	-	-	-	-	-	-	-	-

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III B.Tech I Semester

L	T	P	C
3	1	0	3

16ECE312 LINEAR AND DIGITAL ICAPPLICATIONS

Course Educational Objectives:
CEO1: To provide knowledge on Basics of Operational amplifiers with linear integrated circuits.
CEO2:To understand the linear and non - linear applications of operational amplifiers.
CEO3: Tounderstand the data converters and introduce some special function ICs
CEO4: To understanding the different logic families of digital IC &their applications
CEO5: Gain the knowledge on principle of operations of CPLDs and FPGAs
.

UNIT-1: BASICS OF OPERATIONAL AMPLIFIER
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 : 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- LPF- HPF filters. Band pass- Band reject and all pass filters.

UNIT-3:
SPECIAL ICs: Introduction to 555 timer- functional diagram- Monostable and Astable operations and Schmitt Trigger, VCO and PLL (IC565).
DATA CONVERTERS: 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
Introduction to logic families- CMOS logic- CMOS steady state electrical behavior- CMOS dynamic electrical behavior- 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: Complex Programmable Logic Devices - Xilinx XC9500 CPLD ArchitectureBlock, I/O and Switch matrix - Field-Programmable Gate Arrays - Xilinx XC4000 FPGA Family –CLB, I/O Block and Programmable Interconnect.

Course Outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Demonstrate knowledge on Basics of Operational amplifier&Building blocks of op-amp concepts.	PO1, PO2
CO2	Identify appropriate method anddevelope different non – llinear applications of op-amp.	PO1, PO2, PO3
CO3	Identify appropriate Data converters like ADC and DAC,Special function IC's of 555 timer.	PO1, PO2,PO3
CO4	To demonstrate theknowledgeon design of different digital logic families.	PO1, PO2,PO3, PO4
CO5	Gain the knowledge on principle of operations and applications of digital circuits of XILINX series in CPLDs and FPGAs.	PO1,PO5

Text Book:

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.

Reference Books:

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	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	3	-	-	-	-	-	-	-	-
CO5	3	-	-	-	3	-	-	-	-	-	-	-
CO*	2.8	2.5	2. 3	3	3	-	-	-	-	-	-	-

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III B.Tech I Semester

L	T	P	C
3	1	0	3

16ECE313 VLSI DESIGN

Course Educational Objectives:

CEO1: To provide knowledge on
- Fundamentals of Fabrication Process
- Super integration concepts
- IC Packing techniques.

CEO2: To develop skill to analyze electrical properties of MOS transistor and to analyze the fabrication process of NMOS,PMOS, CMOS, BICMOS .

CEO3: To develop skill to design stick diagrams and layout diagrams for MOS transistors,contacts and wires.

CEO4: To inculcate skill to investigate the effect of floor planning ,placement,routing and power delay estimation in physical design of digital circuits and standard cells,FPGA and CPLD.

CEO5: To develop skill to apply the concept of Combinational and Sequential Circuit Testing and design verification of circuits.

UNIT - 1: VLSI TECHNOLOGY

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 - IC Packing techniques.

UNIT - 2: BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS

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 - NMOS - PMOS - CMOS – BICMOS processes – comparison.

UNIT - 3: VLSI CIRCUIT DESIGN PROCESSES

VLSI design flow - Layers of abstraction - Stick diagrams - Design goals and layout diagrams - sheet resistance R_s - standard unit of capacitance - inverter delays - Propagation delays - Wiring capacitance - Inverter Design aspects – specifications considering worst case parameters .

Design rules and layout - 2µm CMOS design rules for wires - contacts and transistor layout diagrams for NMOS and CMOS inverters and gates - scaling of MOS circuits - limitations of scaling.

UNIT - 4:

PHYSICAL DESIGN:

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 approach for Full custom – Semi custom devices.

UNIT - 5:

TEST AND VERIFICATION:

Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

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Course Outcomes:

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

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	2	3	3	-	2	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	2	-	3	-	-	-	-	-	-	-	-
CO*	2.8	2.4	3	2.3	2	-	-	-	-	-	-	-

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III Year B-Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE 314 COMPUTER ORGANIZATIONS

Course Educational Objectives:

CEO1: To have a thorough understanding of the basic structure and operation of a digital computer.
CEO2: To discuss in detail the operation of the arithmetic unit including the algorithms of addition, subtraction, multiplication & division.
CEO3: To study the Different types of Memories and Parallel processing procedures implemented in computers..
CEO4: To understand the architecture of 8085 Microprocessor and its pin configuration.
CEO5: To develop assembly language programming skills on 8085 processor using different instruction sets.

UNIT-1: BASIC STRUCTURE OF COMPUTERS

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

UNIT-2: COMPUTER ARITHMETIC

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

UNIT-3:

THE MEMORY SYSTEM: Memory Hierarchy, Microprogrammed Control Main memory, Auxiliary memory, Associative memory, Cache memory,Virtualmemory.

PIPELINE AND PARALLEL PROCESSING: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline.

UNIT-4: INTRODUCTION TO 8085 MICROPROCESSOR

Architecture Of 8085 Microprocessor- The 8085 Programming Model- Pin diagram Of 8085-Machine Cycle Status And Control Signals- Addressing Modes.

UNIT-5: PROGRAMMING WITH 8085 MICROPROCESSOR

Instruction Classification- Instruction Format, Programming with an assembler, Assembly language programs**,** Addition, Subtraction, shift and rotate, logical, branch instructions, call and ret instructions, machine control instructions.

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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	Analyze the types of Memory , Pipelining process and abilty to understand the concept of cache mapping techniques and pipeline hazards.	PO1, PO2
CO4	Understand the basic organization of 8085 Microprocessor with the knowledge of Pin Diagram, registers and addressing modes.	PO1
CO5	Be familiar with instruction set and assembly language programming using 8085 processor.	PO1,PO2,PO3, PO4

TEXTBOOKS:

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson.
2. Microprocessor architecture, programming and applications with 8085/8080A 2nd edition,1996, Ramesh S,Goankar, New age international Publishers, New Delhi.
3. Computer Organization – Car Hamacher, Zvonks Vranesic, Safwat Zaky, V Edition, McGraw Hill.

REFERENCE:

1. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson,
2. 8085 Microprocessor and its applications by A.Nagoor kani, 3rd edition, Tata MC Grawhill publications
3. Computer Systems Organization and Architecture, John D. Carpinelli, PEA, 2009
4. Computer Architecture and Organization – John P. Hayes, Mc Graw 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	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-
CO*	3	3	2	3	-	-	-	-	-	-	-	-

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

16ECE315 DIGITAL DESIGN THROUGH VERILOG HDL

Course Objectives:

CEO1: The course intends to provide an overview of the principles, language constructs and programming fundamentals of Verilog HDL.
CEO2: To design the digital systems using Gate level, Data flow and Switch level modeling styles.
CEO3: To design the digital systems using Gate level, Data flow and Behavioral modeling styles.
CEO4: To understand the concepts of Switch level modeling and User Defined Primitives.
CEO5: To get the knowledge on Task, Functions, Compiler Directives and Delay models.

UNIT-1: Overview of Verilog HDL, Hierarchical modeling concepts, Levels of Design Description, Programming Language Interface (PLI), Basic concepts, Lexical Conventions, Data types, modules and ports, Operands & Operator types.

.

UNIT-2:

Gate Level Modeling: Gate types, Basic gates and Tri state gates, Array of instances, Design examples, Gate delays, Design of flip flops with gate primitives.

Dataflow Modeling: Introduction, Continuous Assignment, Delays, Design Examples – 4 to 1 MUX , 4 bit adder.

UNIT III: Behavioral Modeling: 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: Basic Transistor Switches, CMOS Switches, Bi-directional Gates, Power and ground, Resistive switches, Delay specifications,Examples of switch level modeling.

User Defined Primitives: UDP basics, Combinational UDP, Sequential UDP.

UNIT V: System Tasks, Functions and Compiler Directives: Differences between Tasks & Functions, Disable Statements, Named Events, Hierarchical path name, Delays - Types of Delay models, Path delay modeling, Compiler Directives. Advanced Design examples using Verilog HDL – Up-Down Counter, ALU, Barrel Shifter, Floating Point Encoder.

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Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate Knowledge on Verilog HDL and analyze the language constructs to write HDL programs through various levels of abstraction.	PO1, PO2
CO2	Analyze and Design the combinational and sequential systems using gate level primitives and dataflow modeling.	PO1, PO2, PO3,PO4 PO5
CO3	Analyze and Design the combinational and sequential systems using high level of abstraction like behavioral modeling.	PO1, PO2, PO3, PO4, PO5
CO4	Create and use UDPs as well as switch level modeling in designing digital systems. Distinguigh UDPs with switch level.	PO1, PO2, PO3, PO4, PO5
CO5	Demonstrate knowledge on Task, Functions, Compiler Directives and use them in designing digital systems using Verilog HDL. Differentiate the task and functions.	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	2	3	3	2	2	-	-	-	-	-	-	-
CO3	2	2	3	2	2	-	-	-	-	-	-	-
CO4	3	2	3	2	2	-	-	-	-	-	-	-
CO5	2	2	2	3	3	-	-	-	-	-	-	-
CO*	2.4	2.2	2.75	2.25	2.25	-	-	-	-	-	-	-

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III B.TECH I SEM (EEE, E.C.E)

L	T	P	C
3	1	0	3

16EEE223 **CONTROL SYSTEMS**

Course Educational Objectives:

CEO1: To Acquire knowledge on modelling of physical systems such as Mechanical and Electrical systems etc., through applying block diagram reduction and signal flow graph techniques.

CEO2: To Analyze the time domain specification and the corresponding errors for various order and type number of the systems. Control the performance of the system by designing P, PI, PD & PID controllers.

CEO3: To Investigate and analyze the stability of the system in time domains by selecting appropriate methods like Routh array, Root locus methods, etc.

CEO4: To Investigate and analyze the stability of the system in time domains by selecting appropriate methods like Bode plots, Polar plots and Nyquist method.

CEO5: To Acquire knowledge on State Space representation of physical systems, analyze the system's controllability and observability

UNIT I CONTROL SYSTEMS CONCEPTS

The control system - Mathematical models of physical systems – Introduction - Differential equations of physical systems – Mechanical systems - Friction - Translational systems - Rotational systems - Electrical systems - Analogous systems . Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver - Block diagram algebra – Signal flow graph - Reduction using Mason's gain formula. Effect of feedback – sensitivity effect on feedback

UNIT II TIME DOMAIN ANALYSIS

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

UNIT III STABILITY ANALYSIS AND ROOT–LOCUS TECHNIQUES

Concepts of stability - Necessary conditions for Stability - Routh- stability criterion - Relative stability analysis: More on the Routh stability criterion - The root locus concepts - Construction of root loci

UNIT IV FREQUENCY DOMAIN ANALYSIS

Mathematical preliminaries - Nyquist Stability criterion - Polar plots - Assessment of relative stability using Nyquist criterion - Bode plots - Assessment of relative stability using Bode Plots. Compensation techniques – Lag, Lead, Lead-Lag Compensators design in frequency Domain.

UNIT V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

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.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate knowledge on modelling of physical systems such as Mechanical and Electrical systems etc., through applying block diagram reduction and signal flow graph techniques.	PO1, PO5
CO2	Analyze the time domain specification and the corresponding errors for various order and type number of the systems. Control the performance of the system by designing P, PI, PD & PID controllers.	PO1, PO2, PO3
CO3	Investigate and analyze the stability of the system in time domains by selecting appropriate methods like Routh array, Root locus methods, etc	PO1, PO2, PO4,PO5
CO4	Investigate and analyze the stability of the system in time domains by selecting appropriate methods like Bode plots, Polar plots and Nyquist method.	PO1, PO2, PO4, PO5
CO5	Demonstrate knowledge on State Space representation of physical systems, analyze the system's 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	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	2	2	-	3	3	-	-	-	-	-	-	-
CO4	2	2	-	3	3	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	2.4	2.25	2	3	3	-	-	-	-	-	-	-

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

16ECE 316 IC APPLICATIONS LAB

Course Educational Objectives:
CEO1: Gain the practical hands-on experience on 741 Op-Amp applications
CEO2: Gain the practical hands-on experience on 555 timer applications
CEO3: Gain the practical hands-on experience on Voltage Regulator
CEO4: To construct and verify the combinational designs using digital ICs.
CEO5: To construct and verify the sequential designs using digital ICs.

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.

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-74X148.
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

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate the knowledge on Integrated circuits using IC741 and IC555	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**

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

16ECE317 DIGITAL DESIGN THROUGH VERILOG HDL LAB

Course Educational Objectives:

- Gain the practical hands-on experience on verilog HDL programming
- To design, simulate and verify the combinational logic designs using verilog HDL.
- To design, simulate and verify the sequential logic designs using verilog HDL.

LIST OF EXPERIMENTS

Minimum 10 experiments to be conducted:

1. Design and simulation of basic gates and universal gates:NOT,AND,OR,NAND,NOR,XOR and XNOR using data flow modeling using Verilog HDL
2. Design and simulation of half adder and 1-bit full adder using structural and behavioral modeling.
3. Design and simulation of Half sub tractor and 1-bit full subtractor using structural modeling
4. Design and simulation of 8-bit Ripple Carry Adder using structural and behavioral elements.
5. Design and simulation of 8:1 MUX and 1:8 DEMUX using **structural** and **behavioral** (**using Case Statement**) modelings.
6. Design and simulation of 3to 8 Decoder and 8 to 3 Encoder using data flow and structural modelings.
7. Design of 4 bit ALU with addition, subtraction, multiplication, division, AND, OR, XOR and XNOR operations.

Design of Sequential Circuits:

1. Design and simulation of D-Latch (single-if statement) and D-flip-flop (if-else statement)
2. Design and simulation of 4 bit Up counter and Down counter using nested if-else-if statements.
3. Design and Simulation of 4-bit Shift Register.

FPGA Implementation:

1. Pin Assignment, PAR, Bit file generation and Implement any of the combinational designs (Anyone of experiment 1 to 8) on target FPGA hardware.
2. Pin Assignment, PAR, Bit file generation and Implement any of the sequential designs (Anyone of experiment 10 to 12) on target FPGA hardware.

Course Outcomes:

On successful completion of course the students will be able to		POs related to Cos
CO1	Ability to design any basic building blocks and simulate any digital function in Verilog HDL.	PO1
CO2	Get practical experience on how to design combinational logic designs with the help of Verilog HDL	PO2
CO3	Design and simulation of Half subtractor and 1-bit full subtractor using structural modeling	PO3
CO4	Test the functionality of any digital systems by implementing it on FPGA	PO4
CO5	Select appropriate design tools and procedure to simulate and implement combinational and sequential circuits	PO5
CO6	Follow ethical principles in designing, simulating and implementing various combinational and sequential 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 Verilog HDL and FPGA implementation for various application during their life time	PO12

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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**

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III B.Tech I Semester

L	T	P	C
2	0	0	0

P&T REASONING AND APTITUDE - I

Course Educational Objectives:

CEO1: To apply quantitative reasoning techniques to the real time problems.
CEO2: To understand the mathematical analysis for solve the life time 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	Solve the quantitative reasoning techniques to the real time problems	PO1,PO3,PO5,PO12
CO2	Understand the mathematical analysis for solve the life time problems	PO1,PO3,PO5,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, Abhijit Guha, 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 Mapping

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

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

16ECE321 DIGITAL COMMUNICATIONS

Course Educational Objectives:

CEO1: To provide knowledge on overview of communication system and base band digital modulation techniques and their noise calculations.

CEO2: To develop skills & understand the principle of multiplexing & base band digital modulation system, also analyze probability of error performance.

CEO3: To understand the basics of information theory, entropy, analyze their properties and Calculate the transmission efficiency for Source encoding techniques.

CEO4: To know the difference between source coding, channel coding techniques and apply their concepts in the analysis and design of digital communication systems techniques.

CEO5: To distinguish between the Band pass digital systems with the constellation diagrams and analysis of the probability error of all digital modulation techniques.

UNIT – 1: BASE BAND DATA TRANSMISSION-I

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

UNIT – 2: BASE BAND DATA TRANSMISSION-II

Time Division Multiplexing (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 signaling schme, Base band Signal Receiver: Optimum Filter -Matched Filter and its properties, Correlation receiver.

UNIT – 3: SOURCE ENCODING & DECODING

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

Unit – 4: CHANNEL ENCODING AND DECODING

Automatic Repeat Request, Forword error control, Linear block codes, Error detection & correction capabilities of linear block codes, Binary Cyclic Codes and its error detection & Correction capabilities, Convolutional codes : Time domain & Frequency domain Approach, tree diagram, State diagram, Trellis Diagram, Viterbi decoder.

Unit – 5: BAND PASS DATA TRANSMISSION

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, Probability of Error for ASK, FSK, PSK and QPSK, Comparision of digital modulation techniques.

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 convolutionals 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, 2/e,2005,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	3	2		-	-	-	-	-	-	-	-
CO2	3	3	2		-	-	-	-	-	-	-	-
CO3	3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	3	2.8	2.5	2.33	-	-	-	-	-	-	-	-

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III Year B. Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE322 MICROPROCESSOR AND MICROCONTROLLERS

Course Educational Objectives:

CEO1: To provide knowledge on
- Architecture of 8086, Registers and Memory.
- Physical memory organization
- Interrupts of 8086

CEO2: To become skilled in 8086 assembly language programming..

CEO3: To understand the concepts of Programmable Interfacing devices,
- 8086 interfacing with Input output devices.

CEO4: Acquire the knowledge on 8051 Microcontroller architecture and its memory

CEO5: Analyze how the 8051 is interfaced with different peripheral devices.

UNIT-1: 8086 ARCHITECTURE

8086 Overview-Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration, Physical Memory Organization, General Bus Operation- Minimum and Maximum Mode Signals, Timing Diagrams - Interrupts Of 8086.

UNIT-2: INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING

Instruction Formats -Addressing Modes-Instruction Set, Assembler Directives-Macros, Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions – String Manipulations-Simple ALPs.

UNIT-3: PROGRAMMABLE INTERFACING DEVICES

8255 PPI- Block Diagram, Various Modes of Operation-Programmable Interval Timer 8254-Architecture,Operating Modes – Key Board/Display Controller 8279-Architecture, Modes of Operation, D/A and A/D interfacing, Programmable Communication Interface 8251 USART-Architecture, Description Of Operating Modes-DMA Controller 8257.

UNIT-4: 8051 MICROCONTROLLER & ADVANCED MICROCONTROLLERS

Introduction to Micro Controllers 8051, Architecture, Registers, Pin Description, Connections, I/O Ports, Memory Organization, Addressing Modes, Instruction Set, ARM Processors.

UNIT-5: 8051 INTERFACING

Assembly directives, Simple assembly software programs, interfacing with keyboards, 7 segment LEDs, LCDs, Interfacing with ADCs, Interfacing with DACs.

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Understand the 8086 microprocessors internal architecture and its operation within the area of manufacturing.	PO1, PO2
CO2	Apply knowledge and design programming proficiency using the various addressing modes and data transfer instructions of the target microprocessors	PO1, PO2, PO3, PO4
CO3	Analyze and design different I/O devices and how they are interfaced with 8086 microprocessor	PO1, PO2, PO3, PO4
CO4	Understand the 8051 microcontroller internal architecture and its operation within the area of manufacturing .	PO1, PO2
CO5	Analyze and design assembly language programs, select appropriate assemble into machine a cross assembler utility of a advance microprocessors and Interfacing for 8051	PO1, PO2, PO3, PO4

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. Microcontrollers, Theory and applications, Ajay V.Deshmukh,1st edition, Tata McGraw HillCompanies, Newdelhi, 2005.

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 interafacing, KennethJ,Ayala, 1/e, Cenange learning private limited, New Delhi, 2007.
5. Microprocessors and microcontrollers, Krishna Kanth, 2nd edition, PHI learning, New delhi, 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	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	2.8	2	2	2	-	-	-	-	-	-	-	-

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III B.Tech II Semester

L	T	P	C
3	1	0	3

16ECE323 DIGITAL SIGNAL PROCESSING

Course Educational Objectives:

CEO1: To provide knowledge on

- Fundamentals of Signals, Systems
- Analog filters and Digital filters
- Finite word length effects
- Multi-rate signal processing

CEO2: 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

CEO3: To develop skill to design IIR filters, FIR filters, Multi-rate systems

CEO4: To inculcate skill to investigate the effect of finite word length effect in various applications, Suitability of IIR/FIR for various input specifications

CEO5: To develop skill to apply the concept of Multi-rate signal processing in designing of various applications

UNIT-1: Discrete Fourier Transform

Discrete time Signals and Systems - A Review, Classification, Operation, Introduction to DFT – Properties of DFT – Linear Convolution - Circular Convolution – Methods to evaluate Circular Convolution - Linear Convolution from Circular Convolution, Computation of DFT – Fast Fourier Transform – Radix 2 DIT and DIF FFT algorithms – Inverse FFT

UNIT- 2: IIR Filter Design

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

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 – Poly Phase Structures

UNIT-4: Finite Word length Effects

Fixed point and Floating point Number Representations – Quantization Noise - Truncation and Rounding - Quantization noise – Coefficient quantization error – Product quantization error - Overflow error – Round off noise power - limit cycle oscillations due to product round off and overflow errors – Principle of scaling

UNIT-5: Multirate Digital Signal Processing

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

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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	Analyze the effect of word length in digital filter design and implementation	PO1, PO2, PO4
CO5	Understand and use the concept of Multi-rate signal processing in various applications and develop filters for implementation of multirate signal processing	PO1, PO2

Text Book:

1. John G. Proakis&DimitrisG.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007.

Reference Books:

1. Emmanuel C..Ifeachor, &Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata McGraw Hill, 2007.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004.
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	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	2.6	2.6	3	2	2	-	-	-	-	-	-	-

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III B.Tech II Semester

L	T	P	C
3	1	0	3

16ECE 324 TRANSMISSION LINES AND ANTENNA WAVE PROPAGATION

Course Educational Objectives:

CEO1: To understand the transmission line types, parameters, and to analyze the transmission line equation and concepts related to wave propagation in transmission lines.
CEO2: To introduce antennas, their principle of operation, fundamental parameters, and to understand the Dipole antenna, its radiation patterns
CEO3: To understand the Antenna arrays – BSA, EFA, and Binomial
CEO4: To analyze and design VHF, UHF and Microwave antennas
CEO5: Propagation effects in microwave systems, satellite, space, and radar links

UNIT-I: 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- Input Impedance Relations- SC and OC Lines- Reflection Coefficient- VSWR- UHF Lines as Circuit Elements- Impedance Transformations & Matching- Smith Chart and its applications- Illustrative Problems.

UNIT-2: ANTENNA FUNDAMENTALS

Introduction- Radiation Mechanism- Basic Antenna Parameters- Radiation Patterns- Beam widths- Beam Area- Radiation Intensity- Beam Efficiency- Front to Back ratio- Directivity- Gain- Antenna Apertures- Effective Height- field zones- Polarization- Retarded Potentials.

Radiation from Small Electric Dipole- Quarter wave Monopole and Half wave Dipole- Current Distributions- Evaluation of Field Components- Power Radiated- Radiation Resistance- Beam width- Directivity- Effective Area and Effective Height - Loop Antennas.

UNIT-3: ANTENNA ARRAYS

Point sources- arrays of 2 point sources – different cases- N element Uniform Linear Arrays – Broadside- Endfire Arrays- EFA with Increased Directivity- Derivation of their characteristics and comparison - Principle of Pattern Multiplication - Folded Dipoles - Yagi-Uda Arrays - Binomial Arrays.

UNIT-4: VHF- UHF AND MICROWAVE ANTENNAS

Broadband Antennas - Helical Antennas – Axial Mode and Normal Modes- Horn Antennas - Optimum Horns - Design Characteristics of Pyramidal Horns - Paraboloidal Reflectors – Geometry- characteristics- types of feeds- F/D Ratio- Off-set Feeds- Cassegrainian Feeds.

Introduction to Micro strip Antennas - Features- Advantages and Limitations- Rectangular Patch Antennas - Lens Antennas – Geometry- Features- Dielectric Lenses and Zoning- Applications- Introduction to Antenna Measurements.

UNIT-5: WAVE PROPAGATION

Concepts of Propagation – frequency ranges and types of propagations- Ground Wave Propagation– Characteristics- Parameters- Wave Tilt- Flat and Spherical Earth Considerations- Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics - Critical Frequency- MUF and Skip Distance - Optimum Frequency- Virtual Height - Ionospheric Abnormalities - Ionospheric Absorption - Fundamental Equation for Free-Space Propagation- Basic Transmission Loss Calculations- Space Wave Propagation – Mechanism- LOS and Radio Horizon- Tropospheric Wave Propagation – Radius of Curvature of path- Effective Earth's Radius- Effect of Earth's Curvature- Field Strength Calculations - M-curves and Duct Propagation - Tropospheric Scattering.

Course Outcomes:

SNO	On successful completion of the course the student will be able to	PO(1..12) MAPPING
CO1	Knowledge on the transmission line parameters, analyze the loading effects on SC and OC lines and investigate the applications of smith chart.	P01, PO2, PO4
CO2	Demonstrate the radiation of EM waves through antenna and various antenna parameters, analyze Dipole antenna operation.	P01, P02
CO3	Analyze antenna BSA, EFA, arrays with 2 element and N- element cases and demonstrate radiation patterns of arrays, Design Yagi Uda antenna for VHF and UHF ranges.	P01, P03,P04
CO4	Analyze and Design VHF, UHF and Microwave antennas for the required specification and applications.	P01, P03,P04
CO5	Demonstrate the different modes of wave propagation through in atmospheric layers; analyze MUF, Virtual height, LOS etc.	P01, P02

TEXT BOOKS:

1. Elements of Electro Magnetics, 5th Edition, 2010, Matthew N.O. Sadiku, Oxford University Press, NewDelhi.
2. Antennas and Wave Propagation, 4'h ed., (Special Indian Edition), 2010, J.D. Kraus, RJ. Marhefka and Ahmad S. Khan. TMH, New Delhi.
3. Networks, Lines and Fields, 2nd Edition, 1999, John D. Ryder, PHI, New Delhi.
4. Antenna & Wave Propagation, 2001, K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi.

REFERENCES:

1. Electromagnetic Waves and Radiating Systems, 2nd Edition, 2000 E.C. Jordan and K. G. Balmain, PHI, New Delhi.
2. Antenna Theory, 3rd Edition, 2005, C.A. Balanis, John Wiley & Sons.
3. Transmission and Propagation - E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering, 4th Edition, 1955, EE. Terman, McGraw-Hill.
5. Antennas for All Applications , 3rd Edition, 2003, John D. Kraus and Ronald J. Marhefka, TMHl.

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**	**3**	-	-	-	-	-	-	-	-
CO4	**3**	-	**3**	**2**	-	-	-	-	-	-	-	-
CO5	**3**	**2**	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.33**	**2.5**	**2.33**	-	-	-	-	-	-	-	-

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

III B Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE325A ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (Core Elective - I)

Course Educational Objectives:

CEO1: To provide a brief knowledge of measurements and measuring Instruments related to engineering.
CEO2: To give the sufficient information of measurements in any kind of Industry viz. electrical, electronics, mechanical etc
CEO3: Select the instrument to be used based on the requirements.
CEO4: Understand and analyze different signal generators and analyzers.
CEO5: Understand the design of oscilloscopes for different applications.
CEO6: To provide knowledge on different transducers for measurement of different parameters.

UNIT - 1:PERFORMANCE CHARACTERISTICS OF INSTRUMENTS

Static characteristics- Accuracy- Precision- Resolution- Sensitivity- Hysteresis - Errors in Measurement- and their statistical analysis and curve fitting - dynamic characteristics-speed of Response- fidelity- Lag and dynamic error. Analog and Digital systems for measurement - DC voltmeters - Multi range- AC voltmeters –ohm meters – Series type – Shunt type, Multimeter.

UNIT - 2:SIGNAL GENERATORS & ANALYZERS

Signal Generator- 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 - 3:OSCILLOSCOPES

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). Principles of sampling oscilloscope- storage oscilloscope- and digital storage oscilloscope.

UNIT - 4:BRIDGES

Review of DC Bridges: Resistance measurements - Wheatstone bridge. Kelvin Bridge - AC bridges: Measurement of inductance-Maxwell's bridge- Anderson Bridge. Measurement of capacitance- Schering Bridge - Wein Bridge errors and precautions in using bridges.

UNIT - 5:TRANSDUCERS

Overview of Data Acquisition System. Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Illustrate and analyze the operating characteristics of electronic measuring instruments, compute different types of errors in measurements.	PO1,PO2
CO2	Demonstrate knowledge on the working principles of different types of signal generators and analyzers.	PO1,PO2
CO3	Demonstrate Knowledge on functions of CRO and sampling oscilloscope for measuring parameters like amplitude, frequency and time period .	PO1
CO4	Analyze various AC &DC Bridges for measuring resistance, inductance and capacitance parameters and identification of different errors in bridges.	PO1,PO2,PO4
CO5	Identify suitable transducer for the measurement of temperature, displacement and strain,	PO1,PO2

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.

Reference Books:

1. Electronic Test Instruments (Analog & Digital Measurements), Robert A.Witte, 2/e, Pearson Education, New Delhi, 2006.
2. Measurements and Instrumentation, M.Janaki Rani& G.Sathiyabhama, Anuradha, 1/e, Agancies – Chennai, 2005.
3. Electronic Instrumentation & Measurements, David A. Bell, 2/e, Prentice Hall of India, New Delhi. 2003
4. Electronic Measurement and Instrumentation, Oliver and Cage, Tata McGraw Hill, New Delhi**.**
5. 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	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-		-	-	-	-	-	-	-
CO4	3	3	-	2	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	-	2	-	-	-	-	-	-	-	-

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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

16ECE325B FUNDAMENTALS OF NANO- ELECTRONICS (Core Elective – I)

CEO1:To learn and understand basic concepts of Nano electronics.
CEO2:To know the techniques of fabrication and measurement.
CEO3:To gain knowledge about Nanostructure devices and logic device Nano Electronics and Nano Microfabrication course is designed to encompass all these aspects, viz., nano and micro regime design, simulation and fabrication and all types of IC's,microfludics.
CEO4:student is expected that, after undergoing this course, the students will acquire both theoretical knowledge and practical skills in diverse upcoming areas of current technology and will be able to get into any one of these areas or be a bridge between these advanced areas to face the upcoming challenges and up liftment of society

UNIT - 1: INTRODUCTION TO NANOELECTRONICS
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
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
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
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
Logic Devices-Silicon MOSFETs-Ferroelectric Field Effect Transistors-Quantum Transport Devices Based on Resonant Tunneling-Single-Electron Devices for Logic Applications-Superconductor Digital Electronics-Quantum Computing Using Superconductors-Carbon Nano tubes for Data Processing-

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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 BOOK:

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	2	-	-		-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	3	2	2	-	-	-	-	-	-	-	-	-

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III Year B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE325C ARDUINO BASED SYSTEM DESIGN (Core Elective - I)

Course Educational Objectives:

CEO1: To understand the basics of Arduino boards, its basic programming

CEO2: To be able to Interface Arduino with IO devices and control.

CEO3: To acquire experimental ideas in the design of Analog devices and interface Arduino.

CEO4: To apply the concepts in implementing motors and actuators as well as advanced applications like RF modem.

CEO5: To apply the concepts in implementing applications which are useful to the society.

UNIT 1: INTRODUCTION

Introduction, what is Arduino, types of Arduino, features of Arduino, steps in programming using Arduino IDE, Basics of Input-Output devices, sensors, actuators, open loop I/O control, closed loop I/O control.

UNIT 2: ARDUINO AND IO DEVICES

Arduino and Light Emitting Diodes, Liquid Crystal Devices, Arduino and Digital IO devices – push button, Fire sensors, Passive Infrared, Alcohol Sensor .

UNIT3: INTERFACE WITH ANALOG DEVICES

Interface Ultrasonic Sensor with LCD, Ultrasonic Senor – Serial Out and PWM Out, Temperature sensor – Analog Output, Humidity Sensors, LDR and Light Intensity Sensors to interface with LCD interface in Analog mode.

UNIT– 4:

MOTORS, ACTUATORS AND INTERFACE WITH ARDUINO:

Servo motor interface, DC motor, stepper motor, AC motor with Relay. Circuit diagram, program and simulation for these motors and actuators.

ARDUINO IN WIRELESS COMMUNICATIONS:

2.4 GHz RF Modem – Transmitter and Receiver sections – circuit diagram and program. GSM modem-Circuit diagram and program.

UNIT 5: PROJECTS IN ARDUINO

2.4 GHz RF Modem based security system for Restricted area, Coordinate display system using GPS, Wireless Irrigation System for Agriculture Field. Circuit diagram and program for these projects.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Gain knowledge on the basic principles of Arduino System. Apply the programming concepts to design basic embedded system. Differentiate open loop and closed loop I/O model.	PO1, PO2, PO3, PO4, PO5
CO2	Implement the ideas to construct digital I/O devices. Classify the sensors used for digital I/O. Application of Alcohol sensor for society and environment.	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO3	Apply the concept to develop Analog devices. Distinguish the analog sensors with digital. Assess the need for analog sensors in societal and environmental issues.	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO4	Design, apply and interpret to realize the advanced concepts using motors, actuators, RF modem and wireless projects.	PO1, PO2, PO3, PO4, PO5
CO5	Combine various sensors and actuators to design real time projects which are useful for society and environment like security system, GPS coordinate and agricultural irrigation.	PO1, PO2, PO3, PO4, PO5, PO6, PO7

TEXT BOOKS

3. Ardunio Based Embedded Systems: Interfacing, Simulation and LabVIEW GUI, 1/e, 2017, Rajesh Singh, Anita Gehlot, Bhupendra Singh, Sushabhan Choudhury, CRC Press.
4. Arduino Programming, 2015, Richard Blum, Pearson Education

REFERENCES

1. Internet of Things-A handson approach, 2015, Arsheep Bahga, Vijay Madisetti, Orient Blackswan Publishers .
2. Programming Arduino – Getting Started with Sketches, 2/e, 2016, Simon Monk, McGraw-Hill Education.

CO-PO Mapping

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

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

16ECE325D MULTIMEDIA COMPRESSION AND NETWORKS (Core Elective - I)

Course Educational Objectives:

CEO1: Gain fundamental knowledge in understanding the basics of different multimedia networks and applications
CEO2: Analyze compression techniques required to compress text and image
CEO3: Analyze compression techniques required to compress audio and video
CEO4: . Gain fundamental knowledge about multimedia communication across different networks.
CEO5: Gain fundamental knowledge about communication protocols for multimedia networking

UNIT 1: MULTIMEDIA COMMUNICATIONS
Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS, application QoS.

UNIT 2: MULTIMEDIA INFORMATION
Introduction, digital principles, text, images, audio, video. TEXT AND IMAGE COMPRESSION**:** Introduction, compression principles, text compression, image compression.

UNIT3: AUDIO AND VIDEO COMPRESSION
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
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: BROADBAND ATM NETWORKS
Introduction, Cell format, Switch and Protocol Architecture ATM LANs. TRANSPORT PROTOCOL**:** Introduction, TCP/IP, TCP, UDP, RTP andRTCP.

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**
CO2	Understand different compression techniques to compress text and images.	**PO1,PO2**
CO3	Understand different compression techniques to compress audio and video.	**PO1,PO2,PO4**
CO4	Describe multimedia multimedia information networks	**PO1,PO2**
CO5	Describe multimedia Communication across Networks	**PO1,PO2,PO4**

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	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	2		-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-
CO*	3	2.5	-	2	-	-	-	-	-	-	-	-

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III Year B. Tech II semester

L	T	P	C
3	1	0	3

16OSAH321 LASERS AND FIBER OPTICS

Course Educational Objectives:

- Using the knowledge of lasers in electronics and communication engineering.
- To use the knowledge of optical fibers in mechanical and civil engineering students for precise findings.
- To use the lasers in machining and as a cutting and industrial tool.
- To know the applications in science and technology.

UNIT – 1: LASERS INTRODUCTION

Introduction, properties of lasers, spontaneous emission, stimulated absorption and stimulated emission, population inversion, conditions to achieve population inversion, different pumping mechanisms, einstein coefficients.

UNIT – 2: TYPES OF LASERS

Laser types, ruby laser, helium-neon laser, CO_2 laser, semi conductor junction laser, dye laser.

UNIT – 3: APPLICATIONS OF LASERS

Holography, laser fusion reaction, light wave communication using lasers, stimulated Raman effect, lasers in industry (laser welding, hole drilling, laser cutting), lasers in medicine.

UNIT – 4: OPTICAL FIBERS

Introduction, principle of optical fiber, construction of fiber, propagation of laser through the fibers, fiber types.

UNIT – 5: APPLICATION OF FIBERS

Fiber optic communication system, pressure sensor, liquid level sensor, fiber optic endoscope, optical fibers in computer networks.

On successful completion of the course the student will be able to		**POs related to COs**
CO1	**Acquire** the basic knowledge on LASERS	PO1, PO12
CO2	**Identify** different types of LASERS	PO1, PO12
CO3	**Develops** knowledge on different applications of LASERS	PO1, PO12
CO4	**Acquire** the basic knowledge on Optical Fibers	PO1,PO12
CO5	**Develops** knowledge on different applications of Optical Fibers	PO1,PO12

Reference Books:

1. Lasers Theory and Applications, K.Thyagarajan and A.K.Ghatak: Macmillan India Limited, New Delhi.
2. Lasers and Non-Linear Opitics, BBLaud, 2/e, NewAge International (P) limited, Publishers, New Delhi.
3. An Introduction to Fiber Optic Systems, John Powers, Richard D Irwin, 2/e, A Times Mirror Higher Education, Inc Company, USA.

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

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III B.Tech II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OSAH322 ADVANCED MATHEMATICS
(Common to all Branches)

Course Educational Objectives:

CE01: The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
CEO2: To provide knowledge on

- Numerical methods to find a root of an equation
- Analyzing the consistency, stability and convergence of a numerical scheme.
- Number of numerical methods for solving integral equations.
- The relations ship between differential and integral equations, and how to change from one to another.

CEO3: To learn different iterative methods which can be used to solve algebraic and transcendental equations. .
CEO4: To understand, Integral Equations ,Integral Equations come from real life physical problems
CEO5: To explore the practical Knowledge, for each type of PDEs (hyperbolic, parabolic and elliptic), what kind of numerical methods are best suited for and the reasons behind these choices
CEO6: To Learn the principles for designing numerical schemes for PDEs, in particular, finite difference schemes.
CEO7: To learn Differential Equations and Partial Differential Equations that can be transformed into Integral and integro- differential equations

Unit-1 Solutions Of Algebraic And Transcendental Equations:

Introduction -Secant Method Or Chord Method -Newton Raphson Extended Formula: Chebyshev Method – Horner's Method - Muller's Method

Unit-2 Partial differential equations:

Introduction – Formation of partial differential equations – solution of a partial differential – equations solvable by direct integration – linear equation of first order- non linear equation of first order – Charpit's method – homogenous linear equations with constant coefficient – Rules of finding complementary function – rules of finding particular integral – working procedure to solve homogeneous linear equations of any order.

Unit-3 Numrical solution of partial differential equations:

Introduction-Solution of Laplace equation, Solution of poisons equation, solution of heat equation(crank-Nicolson method) -Solution of wave equation

Unit- 4 Numerical Solution of Matrix Computation :

Algebraic Equations – Numerical Solution -Matrix Computation: Iterative Methods - Jacobi Method - Gauss-Seidel Method – Successive Over Relaxation method

Unit-5 Integral Equations

Introduction- Definition- conversion of a linear Differential equation to an Integral equation and vice versa- conversion of boundary value problem into integral equation using Green's function – Solution of an integral equation – Abel's Integral equation.

Course Outcomes:

On completion of this course, a successful student is able to		**POs related to COs**
CO1	Acquire knowledge in necessity and techniques of advanced mathematical methods, to develop analytical and designing skills in mathematical models through numerial techniques.	PO1,PO2
CO2	Demonstrate knowledge in Partial differential equations of higher order, mathematical modelling through partial differential equations,	PO1,PO2,
CO3	Demonstrate knowledge in Numrical solution of partial differential equations. Develop analytical and numerical skills in solving Partial Differential Equations	PO1,PO2,P03
CO4	Acquire knowledge in Numerical Solution of Matrix Computation. Develop designing and analytical skills in applications of Advanced Numerical Techniques for solving system of equations by matrix computations.	PO1,PO2
CO5	Acquire knowledge in solving Integral equation and develop designing and analytical skill in conversion of boundary value problem into integral equation	PO1,PO2,PO3 PO4

Text Books:

1. Numerical Methods for Scientific and Engineering. Computation , M.K. Jain, S.R.K. Iyengar R.K. Jain, New Age international Publishers.
2. Higher Engineering Mathematics - Dr.B.S.Grewal - Khanna Publishers

References:

1. Mathematical Methods – Pal – Oxford.
2. Introduction to Numerical Analysis – S.S. SastryPh - I
3. Mathematical Methods, S.K.V.S. Sri Ramachary, M. BhujangaRao, P.B. BhaskarRao& P.S. Subramanyam, BS Publications.
4. "Linear Integral Equations ,Theory and Technique ", 1st ed.,Ram P .Kanwal, Academic press, New York,1971.
5. "Numerical Methods of Engineers" by D V Griffiths and I M Smith

CO-PO Mapping

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

16OSAH323 MATHEMATICAL MODELLING
(Common to all Branches)

Course Educational Objectives:

CE01: The course is designed to equip the students with the necessary mathematical skills and techniques thatare essential for an engineering course.

CEO2: To provide knowledge on

- Mathematical modelling through trigonometry
- Designing mathematical models through Ordinary differential equations
- Mathematical modelling through Linear Programming
- Designing mathematical models through Difference equations
- Partial differential equations based mathematical models

CEO3: To learn the needand techniquesof mathematical modelling, to design mathematical models through trigonometry.

CEO4: To understand, familiarize the knowledge of the significance of ordinary differential equations based mathematical models through linear growth and decay models, compartment models and geometrical problems.

CEO5: To explore the practical utility of mathematical models through linear programming including transportation and assignment models.

CEO6: To learn the concepts of linear difference equations with constant coefficients and understand some simple models through difference equations

CEO7: 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 Mathematical Modelling: Need, Techniques, Classifications And Simple Illustrations

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 First Order

Mathematical Modelling Through Differential Equations – Linear Growth and Decay Models - Compartment Models - Mathematical Modelling in Dynamics Through Ordinary Differential Equations of First Order - Mathematical Modelling of Geometrical Problems Through Ordinary Differential Equations of First Order

UNIT-3 Mathematical Modelling Through Linear Programming

Mathematical Modelling through Linear Programming - Graphical Method - Simplex Method - Transportation and Assignment Models

UNIT-4 Mathematical Modelling through Difference Equations

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

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

Course Outcomes:

After the completion of this course, a successful student is able to		**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.	PO1,PO2
CO2	Demonstrate knowledge in Ordinary differential equations of first order, mathematical modelling through differential equations, Linear growth and decay models and Develop analytical skills in modelling geometrical problems through Ordinary differential equations of first order	PO1,PO2
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,P03
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
CO5	Acquire knowledge in partial differential equations and develop designing and analytical skills in modeling and 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
3. Mathematical Modelling , D N P Murthy, N W Page, E Y Rodin, Pergamon Press,1990
4. OR Theory & Applications, J.K. Sharma , Mac Milian India Ltd., 1998
5. 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	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	-	-		-	-	-		-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-
CO*	2.6	2.4	2	2	-	-	-	-	-	-	-	-

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

III B. TECH II-SEMESTER

L	T	P	C
3	1	0	3

16OCSE321 OBJECT ORIENTED PROGRAMMING

Course Educational Objectives:

CEO1: To study the syntax, semantics and features of Java Programming Language.
CEO2: To understand the principles of packages and inheritance.
CEO3: Todevelop Java application programs using exceptions and interfaces.
CEO4: To gain knowledge on multithreading and applets
CEO5: To create GUI applications & perform event handling.

UNIT – 1: BASICS OF JAVA

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 – Exploring the String Class.

UNIT – 2: INHERITANCE AND PACKAGES:

Inheritance: Basics of Inheritance - Base Class Object - Subclass - Forms of Inheritance - Extension-Limitation - Benefits of Inheritance - Costs of Inheritance - Member Access Rules – Using Super - Using Final - Polymorphism- Method Overriding - Abstract Classes.

Packages: Defining - Creating and Accessing a Package - Understanding CLASSPATH – Importing Packages - Exploring Packages.

UNIT - 3: INTERFACES AND EXCEPTION HANDLING

Interfaces: Differences between Classes and Interfaces - Defining an Interface – Implementing Interface - Applying Interfaces - Variables in Interfaces and Extending Interfaces.

Exception Handling: Concepts of Exception Handling - Benefits of Exception Handling – Exception Hierarchy - Usage of Try - Catch - Throw - Throws and Finally - Built in Exceptions - Creating own Exception Sub Classes - Checked and Unchecked Exceptions.

UNIT – 4: MULTI THREADING AND APPLETS

Multi-Threading: Differences between Multi-Threading and Multitasking - 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.

UNIT - 5: EVENT HANDLING AND AWT AND SWINGS

EVENT HANDLING AND AWT: Events - Event Sources - Event Listeners - Event Classes – DelegationEvent Model - Handling Mouse and Keyboard Events - Adapter Classes - Inner Classes - The AWT Class Hierarchy - AWT Components - Layout Managers - Graphics.

Swings - Introduction - Limitations of AWT - MVC Architecture - Components - Containers -Exploring Swing - JApplet - JFrame and JComponent - JLabel and Imageicon - JTextfield - JButton - Check Boxes - Radio Buttons - JCombobox - JTabbedpane - JScrollpane - Trees - JTable.

Course Outcomes:

On Successful completion of this course student should 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, 7th editon, TMH.
2. Beginning Java2 JDK , Ivor Horton's, 5th 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.

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	3	3	2	2	-	-	-	-	-	-	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2
CO3	3	3	2	3	3	-	-	-	-	-	-	2
CO4	3	3	2	-	3	-	-	-	-	-	-	-
CO5	3	3	2	-	3	-	-	-	-	-	-	-
CO*	3	3	2.4	2.6	2.8	-	-	-	-	-	-	2

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

III B. Tech II Semester

		L	T	P/D	C
16OCSE322	**PROBLEM SOLVING USING PYTHON PROGRAMMING**	**3**	**1**	**-**	**3**

Course Educational Objectives:

CEO1: To understand the basics of problem solving and python programming.
CEO2: To develop the basic skills of Python program in interactive and script mode.
CEO3: To design control structure like selection control and iterative control statement.
CEO4: To construct Python programs using Lists, Dictionaries and sets
CEO5: 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

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

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

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

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

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.

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	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	-	-	-	-	-	-	-

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

III B.Tech II Semester

L	T	P	C
3	1	0	3

16OCSE323 WEB PROGRAMMING

Course Educational Objectives:

CEO1: To understand how to write a valid HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms.
CEO2: To Analyzeadvanced concepts of HTML5 and use CSS to implement a variety of presentation effects in HTML documents.
CEO3: To develop client-side scripting on web pages to provide interactivity and rapid response to user actions at client side.
CEO4: Tounderstand basics of server side scripting language.
CEO5: To gain knowledge about sending the data from client side to server, creating sessions and interactwith database.

UNIT – 1: INTRODUCTION TO INTERNET AND WORLD WIDE WEB
Introduction to networks, LAN, MAN and WAN, history of the internet, E-mail concepts, sending and receiving files by E-mail, intranet, web system architecture, exploring HTTP, URL, domain name system, web browsers, web pages.

UNIT – 2: HYPERTEXT MARKUP LANGUAGE AND WEB DESIGN
Basics of HTML, HTML document display, formatting text, link, lists, images, tables, forms, frames, website design consideration.

UNIT – 3: USAGE OF CASCADING STYLE SHEET
Syntax of CSS, style sheets types, properties and text attributes padding, list properties, list properties, positioning, margins, colors, properties and table attributes.

UNIT – 4: FUNDAMENTALS OF JAVA SCRIPT
DHTML, HTML and JavaScript, JavaScript elements, variables, operators, flow control statements, arrays, functions, event handling, browsers and JavaScript, web pages and JavaScript, frames and JavaScript, validation of user form.

UNIT – 5: SERVER-SIDE PROGRAMMING
PHP: client-side scripting and server-side scripting, introduction to PHP, data types, variables, constants, expressions, string interpolation, control structures, functions, arrays, embedding PHP code in web pages.

Course Outcomes:

On Successful completion of this course student should be able to		**POs related to COs**
CO1	Create web pages using different elements of HTML	PO1,PO2,PO5
CO2	Apply styles to the HTML elements in web pages using CSS	PO1,PO2,PO3,PO5
CO3	Use client side scripting to make the web pages responsive and interactive.	PO1,PO2,PO3,PO5
CO4	Demonstrate knowledge on basics of server side scripting language: PHP	PO1,PO2,PO3,PO5
CO5	Develop web applications with database interaction	PO1,PO2,PO4,PO5

Text Books:

1. A Complete Guide to Internet and Web Programming, Deven N. Shah, 2012, Dream Tech Press, New Delhi.
2. Beginning PHP and MySQL, W. Jason Gilmore, 4/e, 2011, Apress.

References Books:

1. Web Programming, Building Internet Applications, Chris Bates, 3/e, Dream Tech Press, New Delhi.
2. Internet and Web Technologies, Raj Kamal, Tata McGraw Hill, New Delhi.
3. Internet: The Complete Reference, Margaret Levine Young, 2/e, Tata McGraw Hill, 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	PO 10	PO 11	PO 12
CO1	3	2	-	-	3	-	-	-	-	-	-	-
CO2	2	3	3	-	3	-	-	-	-	-	-	-
CO3	2	3	3	-	3	-	-	-	-	-	-	-
CO4	2	3	3	-	3	-	-	-	-	-	-	-
CO5	3	3	-	2	3	-	-	-	-	-	-	-
CO*	2.4	2.8	3	2	3	-	-	-	-	-	-	-

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

16OCIV321 CONSTRUCTION EQUIPMENT, PLANNING AND MANAGEMENT

Course Educational Objectives:

CEO1: To learn basics of construction management

CEO2: To learn various equipment and financial aspects involved in construction project management

CEO3: To develop ability to analyze and develop network diagrams for better monitoring of the project

UNIT – 1: FUNDAMENTALS OF CONSTRUCTION TECHNOLOGY

Fundamentals of Construction Technology: 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. **Preparatory Work and Implementation:** Site layout – Infrastructure development – Construction methods – Construction materials – Deployment of construction equipment – Prefabrication in construction – False work and temporary works.

UNIT – 2: EARTHWORK AND CONSTRUCTION EQUIPMENT

Earthwork: Classification of soils – Project site – Development – Setting out – Mechanized excavation – Groundwater control – Trenchless (no-dig) technology – Grading – Dredging. **Construction Equipment:** Introduction to construction equipment: their contribution and importance in construction industry classification of construction equipment – Earth moving equipment – Excavation equipment – Hauling equipment – Earth-compaction equipment – Hoisting equipment – Concreting plant and equipment – Selection of equipment – Task consideration – Cost consideration – Factors affecting the selection – Factors affecting cost owning and operating the equipment – Equipment maintenance.

UNIT – 3: PROJECT MANAGEMENT

Project Management: 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 net work problems. **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.

UNIT – 4: PERT

Time Estimates and Time Computations: Introduction – Uncertainties: Use of PERT – Time estimates – Frequency distribution – Mean, variance and standard deviation – Probability distribution – Beta distribution – Expected time Problems – Earliest expected time – Formulation for TE - Latest allowable occurrence time – Formulation for TL - Combined tabular computations for TE and TL problems.

UNIT – 5: CPM

Network Analysis: Introduction - Slack – Critical path – Illustrative examples – Probability of meeting scheduled date Problems – 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.

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Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Describe fundamentals of construction technology and preparatory works	PO1, PO6, PO7
CO2	List various construction equipment and explain associate factors in choosing the right one	PO1, PO2
CO3	Analyze and develop network diagrams	PO1, PO2, PO3, PO11
CO4	Apply PERT and compute required parameters	PO1, PO2, PO3, PO11
CO5	Analyze network diagrams using CPM	PO1, PO2, PO11

Text Books:

1. Construction Technology, SubirK.Sarkar and SubhajitSaraswati, Oxford Higher Education Univ. Press, Delhi.
2. Project Planning and Control with PERT and CPM, Dr.Punmia, B.C, Khandelwal, K.K., Lakshmi Publications New Delhi.
3. Construction Project Management, Jha, Pearson publications, New Delhi.

Reference Books:

1. Optimal Design of Water Distribution Networks, Bhave, P.R., 2003, Narosa Publishing house.
2. Operations Research, SankarIyer, P., TMH Pubilications, New Delhi.
3. Operations Research, Ramanathan, N., TMH Pubilications, New Delhi.
4. Total Project Management, The Indian Context, Joy, P.K., Mac Millan Publishers India Limited.
5. Construction Planning, Equipment and Methods, Robert L.Peurifoy, Mc-Graw Hill publishing company

CO-PO Mapping

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

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

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

16OCIV322 REMOTE SENSING AND GIS

Course Educational Objectives:

CEO1: To know the basics, importance, analysis and applications of RS and GIS
CEO2: To study the various types of operating systems of RS and GIS
CEO3: To know the applications of RS and GIS

UNIT – 1: EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL

Definition of remote sensing and its components – Electromagnetic spectrum – Wavelength regions important to remote sensing – Wave theory, particle theory, Stefan-Boltzman and Wein's displacement law – Atmospheric scattering, absorption – Atmospheric windows – Spectral signature concepts – Typical spectral reflective characteristics of water, vegetation and soil.

UNIT – 2: PLATFORMS AND SENSORS

Types of platforms – Orbit types, sun-synchronous and geosynchronous – Passive and active sensors – Resolution concept – Pay load description of important earth resources and meteorological satellites – Airborne and space borne TIR and microwave sensors.

UNIT – 3: IMAGE INTERPRETATION AND ANALYSIS

Types of data products – Types of image interpretation – Basic elements of image interpretation – Visual interpretation keys – Digital image processing – Pre-processing – Image enhancement techniques – Multispectral image classification – Supervised and unsupervised.

UNIT – 4: GEOGRAPHIC INFORMATION SYSTEM

Introduction – Maps – Definitions – Map projections – Types of map projections – Map analysis – GIS definition – Basic components of GIS – Standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – Measurement scales – Data Base Management Systems (DBMS).

UNIT – 5: DATA ENTRY, STORAGE AND ANALYSIS

Data models – Vector and raster data – Data compression – Data input by digitization and scanning – Attribute data analysis – Integrated data analysis – Modeling in GIS highway alignment studies – Land information system.

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	List various theories associated with remote sensing and spectral reflective characteristics	PO1
CO2	Discuss various types of platforms and sensors used in remote sensing applications	PO1
CO3	Know various data interpretation techniques and perform basic analysis	PO1, PO2
CO4	Explain basic features and components of GIS	PO1
CO5	Analyze the data for GIS	PO1, PO2, PO5

Text Books:

1. Remote Sensing and Image Interpretation, Lillesand,T.M., Kiefer, R.W. and J.W.Chipman, 5/e, 2004, John Willey and Sons Asia Pvt. Ltd., New Delhi.
2. Textbook of Remote Sensing and Geographical Information System, Anji Reddy, M. 2/e, 2001, BS Publications, Hyderabad.

Reference Books:

1. Concepts and Techniques of Geographic Information Systems,Lo. C.P.and A.K.W.Yeung, 2002, Prentice Hall of India Pvt. Ltd., New Delhi.
2. Principles of GIS, Peter A.Burrough, Rachael A. McDonnell, 2000, Oxford University Press.
3. An Introduction to GIS, Ian Heywood, 2000, Pearson Education Asia.

CO-PO Mapping

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

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

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

16OCIV323 GREEN BUILDINGS AND ENERGY CONSERVATION

Course Educational Objectives:

CEO1: Explore alternate building materials for sustainability

CEO2: Learn mechanism of thermal flow in buildings

CEO3: Learn various governing codes and guidelines for the green buildings

UNIT – 1: GREEN BUILDING CONCEPTS

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

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

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

Material properties, energy efficiency using various materials, emerging new materials construction techniques – Techniques for roof, wall and foundations.

UNIT – 5: ECONOMY OF GREEN BUILDING

Cost of building, operation and maintenance – Green building rating system, evaluation criteria of LEED, TERI GRIHA case studies, case studies in different climate zones.

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Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Explain the basic features of green buildings	PO1, PO6, PO7
CO2	Describe various architectural features of green buildings	PO1, PO6, PO7
CO3	Analyze thermal flow in buildings and compute basic computations relevant to thermal flow	PO1, PO2, PO6, PO7
CO4	Name various green building materials and describe their basic properties	PO1, PO6, PO7
CO5	Explain economy aspects of green buildings and Analyze case studies	PO1, PO2, PO6, PO7, PO9

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–Hill Publishing Company, New Delhi.
2. Sustainable building design manual (Vol.II), TERI & ICAEN (Institut Catalad Energia), 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.
2. Manual of Tropical Housing and Building, Koenigsberger, O., ingersoll, T. G., Mayhew, A., & Skozolay, S. V., 2011, Universities Press, Hyderabad.
3. Building Design and Drawing, Prabhu, Balagopal T S, K Vincent Paul, and C Vijayan, 2008, Calicut:Spades Publishers.

CO-PO Mapping

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

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
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III Year B. Tech II semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OEEE321 POWER PLANT INSTRUMENTATION

Course Educational Objectives:

CEO1: To provide an overview of different methods of power generation with a particular stress on thermal power generation.
CEO2: To bring out the various measurements involved in power generation plants.
CEO3: To provide knowledge about the different types of devices used for analysis.
CEO4: To inpart knowledge about the different types of controls and control loops.
CEO5: To familiarize the student with the methods of monitoring different parameters like speed, vibration of turbines and their control.

UNIT-I OVERVIEW OF POWER GENERATION
Brief survey of methods of power generation – Hydro, thermal, nuclear, solar and wind power – Importance of instrumentation in power generation – Thermal power plants – Block diagram – Details of boiler processes - UP&I diagram of boiler – Cogeneration.

UNIT-II MEASUREMENTS IN POWER PLANTS
Electrical measurements – Current, voltage, power, frequency, power factor etc. – Non electrical parameters – Flow of feed water, fuel, air and steam with correction factor for temperature – Steam pressure and steam temperature – Drum level measurement – Radiation detector – Smoke density measurement – Dust monitor.

UNIT-III ANALYSERS IN POWER PLANTS
Flue gas oxygen analyser – Analysis of impurities in feed water and steam – Dissolved oxygen analyser – Chromatography – pH meter – Fuel analyser – Pollution monitoring instruments.

UNIT-I V CONTROL LOOPS IN BOILER
Combustion control – Air/fuel ratio control – Furnace draft control – Drum level control – Main steam and reheat steam temperature control – Super heater control – Air temperature – Deaerator control – Distributed control system in power plants – Interlocks in boiler operation.

UNIT-V TURBINE – MONITORING AND CONTROL
Speed, vibration, shell temperature monitoring and control – Steam pressure control – Lubricant oil temperature control – Cooling system.

Course Outcomes:

On Successful completion of this course student should be able to		POs related to COs
CO1	Understand the basics of Power plant and power generation	PO1
CO2	Analyze the design of Analyzers and control loops used in power plant	PO1, PO2
CO3	Detailed study of the P&I diagram of various power plant.	PO1, PO2
CO4	Acquire knowledge on Pollution monitoring instruments	PO1
CO5	Know the distributed control system in power plants	PO1

TEXT BOOKS

1. Sam G. Dukelow, 'The Control of Boilers', Instrument Society of America, 1991.
2. P.K. Nag, 'Power Plant Engineering', Tata McGraw Hill, 2001.

REFERENCE BOOKS

1. S.M. Elonka and A.L. Kohal, 'Standard Boiler Operations', Tata McGraw Hill, New Delhi,1994.
2. R.K.Jain, 'Mechanical and Industrial Measurements', Khanna Publishers, New Delhi, 1995.
3. E.Al. Wakil, 'Power Plant Engineering', Tata McGraw Hill, 1984

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO*	2.8	2.5	-	-	-	-	-	-	-	-	-	-

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

16OEEE322 NEURAL NETWORKS AND FUZZY LOGIC

Course Educational Objectives:

CEO1: To understand the fundamental theory and concepts of neural networks, neuro modeling, several neural network paradigms and its applications.
CEO2: To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning.
CEO3: To know about fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
CEO4: To understand the basics of an evolutionary computing paradigm known as genetic algorithms
CEO5: To know application of genetic algorithms for engineering optimization problems.

UNIT-I ARTIFICIAL NEURAL NETWORKS

Introduction - biological neuron - artificial neuron - basic concepts of neural networks - basic models of ANN connections - Mc-Culloch-pitts model - characteristics of ANN.
Artificial neuron model - operations of artificial neuron - types of neuron activation function - ANN Architectures - classification taxonomy of ANN- Connectivity - neural dynamics(Activation and Synaptic) - learning strategy (supervised - unsupervised - reinforcement) - learning rules - types of application.

UNIT-II SUPERVISED LEARNING NETWORKS

Perceptron network - perceptron learning rule - Architecture - perceptron training algorithm - ADALINE - MADALINE

UNIT-III FEEDBACK NEURAL NETWORKS

Back propagation network - BP Learning rule - input layer computation - hidden layer computation - output layer computations - radial basis function.

UNIT-IV ASSOCIATIVE MEMORY NETWORK

Training algorithm for pattern association - Auto associative memory network - Hetero associative memory network - BAM - Hopfield network.

UNIT-V FUZZY LOGIC

Introduction to classical sets – properties - operations and relations; fuzzy sets - member ship - uncertainty - operations - properties - fuzzy relations - cardinalities - membership functions.
Fuzzification - member ship value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods.

Course Outcomes:

On successful completion of course, student will be able to		POs related to COs
CO1	Understand importance of soft computing.	PO1, PO2
CO2	Understand different soft computing techniques like, Fuzzy Logic, Neural Networks and their combination.	PO1, PO2
CO3	Implement algorithms based on soft computing.	PO1
CO4	Apply soft computing techniques to solve engineering or real life problem.	PO1
CO5	Know the concepts of Fuzzy Logic.	PO1, PO2

TEXT BOOKS:

1. Introduction to Artificial Neural systems,2/e -2012 , jacek M Zurada-west publishing company USA
2. Neural networks - fuzzy logic - genetic algorithms: synthesis and applications ,1/e - 2003, rajasekharan and pai -PHI publications-new Delhi.

REFERENCE BOOKS:

1. Principles of- soft computing ,2/e, S. N. Sivanandam and S.N.Deepa - Wiley india pvt ltd-new Delhi.
2. Nueral Networks and Learning Machines ,3/e,2009,Simon Haykin Phi Learning -new delhi.
3. Soft Computing & Intelligent Systems ,1/e,2007,Madan M Gupta ,Naresh K Sinha ,Elsevier India Pvt Ltd -new delhi.

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	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2	-	-	-	-	-	-	-	-	-	-

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

16OEEE323 SENSORS AND INSTRUMENTATION

Course Educational objectives:

CEO1: To understand operation of sensors and transducers
CEO2: To gain knowledge in pressure and flow measurement using sensors
CEO3: To gain knowledge in displacement and velocity measurement using sensors
CEO4: To understand how electrical sensors are used to measure non-electrical quantities
CEO5: To understand about photoelectric phenomenon, photoelectric transducers, Photo-voltaic transducers

UNIT I MEASUREMENT, INSTRUMENTATION AND CALIBRATION

Introduction, classification of transducers, performance characteristics-static and dynamic characteristics. Errors in measurement- Gross errors, Systematic errors, Statistical analysis of random errors, calibration and standards- process of calibration, classification for standards, standards for calibration.

UNIT- II PASSIVE ELECTRICAL TRANSDUCER-I

Introduction, Resistive transducers- resistance thermometers, hot wire resistance transducers, Resistive displacement transducer, Resistive strain transducer, resistive pressure transducer, resistive optical radiation transducers.

UNIT- III PASSIVE ELECTRICAL TRANSDUCER-II

Inductive transducers- Inductive thickness transducers, Inductive displacement transducers, Movable core-type Inductive transducers, eddy current type Inductive transducers. Capacitive transducers- Capacitive thickness transducers, capacitive displacement transducers, capacitive moisture transducers.

UNIT- IV ACTIVE ELECTRICAL TRANSDUCERS-I

Introduction, thermoelectric transducers, thermoelectric phenomenon, common thermocouple systems, piezoelectric transducers, piezoelectric phenomenon piezoelectric materials, piezoelectric force transducers, piezoelectric strain, piezoelectric torque transducers, piezoelectric pressure transducers, piezoelectric acceleration transducers.Magnetostrictive transducers- Magnetostrictive force transducers, Magnetostrictive acceleration transducers, Magnetostrictive torsion transducers, Hall Effect transducers, and application of Hall transducer.

UNIT- V ACTIVE ELECTRICAL TRANSDUCERS-II

Electromechanical transducers-Tachometers, variable reluctance tachometers Electrodynamic vibration transducers, Electromagnetic pressure electromagnetic flow meter. Photoelectric transducers- photoelectric phenomenon, photoelectric transducers, Photo-voltaic transducers, Photo emissive transducers.

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Course Outcomes:

On successful completion of course, student will be able to		POs related to COs
CO1	Acquire knowledge on Temperature measurement sensors.	PO1, PO2
CO2	Know the concepts of Pressure and flow measurement	PO1, PO2
CO3	Understand Displacement and velocity measurement	PO1, PO2
CO4	Gain knowledge on electrical passive transducers.	PO1, PO2
CO5	Understand using electrical active transducers.	PO1, PO2

TEXT BOOKS:

1. Transducers and Instrumentation – D.V.S. Murthy, 2nd Edn, PHI Ltd, 2010.

REFERENCE BOOKS:

1. Measurement Systems: Applications and Design – Ernest O. Doebelin, 5th Edn,TMH, 2004.
2. Peter Elgar ,"Sensors for Measurement and Control", Addison- Wesley Longman Ltd, 1998

CO-PO Mapping

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

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III B. TECH II-SEMESTER

L	T	P	C
3	1	0	3

16OMEC321 INDUSTRIAL ROBOTICS

Course Educational Objectives:

CEO1: To understand the basic concepts associated with the design and functioning of robots.
CEO2: To know the robot drive systems and design of internal grippers and external grippers
CEO3: To study about the sensors used in robots and its applications .
CEO4: To learn about analyzing robot kinematics and robot programming.
CEO5: To study about the Implementation of robots in industries and Safety considerations.

UNIT – 1: FUNDAMENTALS OF ROBOT

Definition – Robot anatomy – Co-ordinate systems, work envelope, types and classification – Specifications – Pitch, yaw, roll, joint notations, speed of motion, pay load – Robot parts and functions – Need for robots – Different applications.

UNIT – 2:

Pneumatic drives – Hydraulic drives – Mechanical drives – Electrical drives – D.C. servo motors, stepper motor, A.C. servo motors – Salient features, applications and comparison of drives end effectors – Grippers – Mechanical grippers, pneumatic and hydraulic grippers, magnetic grippers, vacuum grippers, two fingered and three fingered grippers, internal grippers and external grippers, selection and design considerations.

UNIT – 3: ROBOT SENSORS AND MACHINE VISION

Requirements of a sensor, principles and applications of the following types of sensors – Position of sensors (piezo electric sensor, LVDT, resolvers, optical encoders, pneumatic position sensors), range sensors (triangulation principle, structured, lighting approach, time of flight range finders, laser range meters), proximity sensors (inductive, Hall effect, capacitive, ultrasonic and optical proximity sensors), touch sensors, (binary sensors, analog sensors), wrist sensors, compliance sensors, slip sensors. 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 and object recognition – Algorithms – Applications – Inspection, identification, visual serving and navigation.

UNIT – 4: ROBOT KINEMATICS AND ROBOT PROGRAMMING

Robot Kinematics: Forward kinematics, inverse kinematics and differences –Forward kinematics and reverse kinematics of manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – Deviations and problems. **Robot Programming:** Teach pendant programming –Lead through programming– Robot programming languages – VAL programming – Motion commands, sensor commands, end effecter commands, and simple programs.

UNIT – 5: IMPLEMENTATION, ROBOT ECONOMICSAND APPLICATIONS

Implementation and Robot Economics:RGV, AGV – Implementation of robots in industries – Various steps – Safety considerations for robot operations – Economic analysis of robots – Pay back method – EUAC method – Rate of return method.**Applications:**Material transfer – Material handling – Loading and unloading - Processing - Spot and continuous arc welding and spray painting – Assembly and inspection.

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the basic concepts associated with the design and functioning of robots.	PO1,PO2,PO3
CO2	Demonstrate the robot drive systems and design of internal grippers and external grippers	PO1,PO2,PO3
CO3	Explain the basic concepts associated with the sensors used in robots and its applications .	PO1,PO2,
CO4	Understand about analyzing robot kinematics and robot programming.	PO1, PO2, PO3
CO5	Explain the implementation of robots in industries and Safety considerations in workplace	PO1, PO2, PO6

Text Books:

1. Industrial Robotics-Technology, Programming and Applications, M.P.Groover, 2001, McGraw-Hill.
2. Robotics Control, Sensing, Vision and Intelligence, Fu.K.S. Gonzalz.R.C., and Lee C.S.G., 1987, McGraw-Hill Book Co.

Reference Books:

1. Fundamentals of Robotics Analysis and Control, C Robert J Schilling, 2009, Pearson Education.
2. Introduction to Robotics Mechanics and Education, Craig J.J., 2008.
3. Robotics Technology and Flexible Automation, Deb S.R. and Deb S., 2010, McGraw Hill Education.
4. The Robotics Primer, Maja J Mataric, 2009, Universities Press.
5. Foundation of Robotics: Analysis and Control, Yoshikawa, 2004, Prentice Hall of India.

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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
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	2	1	-	-	-	-	-	-	-	-	-
CO.3	3	2		-	-	-	-	-	-	-	-	-
CO.4	3	2	2	-	-	-	-	-	-	-	-	
CO.5	3	1	-	-	-	1	-	-	-	-	-	
CO	3	2	1.66	-	-	1	-	-	-	-	-	-

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III B. TECH II-SEMESTER

L	T	P	C
3	1	0	3

16OMEC322 OPTIMIZATION TECHNIQUES

Course Educational Objectives:

CEO1: To introduce the fundamental concepts of optimization techniques and linear programming.

CEO2: To provide the concepts of various transportation models and network models

CEO3: To understand the importance and solution of inventory and queuing models

CEO4: To solve the problem related to decision theory

CEO5: To provide knowledge on classical and modern methods of constrained and unconstrained problems in both single and multivariable

UNIT – 1: OPTIMIZATION TECHNIQUE AND LINEAR PROGRAMMING

Optimization Technique: Introduction **–** Single variable optimization **–** Multivariable optimization with no constraints **–** Multivariable optimization with equality constraints **–** Multivariable optimization with inequality constraints **–** Convex programming problem.**Linear Programming**: The phase of an operation research study – Linear programming – Graphical method – Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT – 2: TRANSPORTATION MODELS AND NETWORK MODELS

Transportation assignment models –Traveling salesman problem **–** Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT – 3: INVENTORY MODELS AND QUEUEING MODELS

Inventory Models: Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice. **Queueing Models:** Queueing models **–** Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT – 4: DECISION MODELS

Decision models – Game theory – Two person zero sum game – Graphic solution **–** Property of dominance – Algebraic solution **–** Replacement models – Items that deteriorate with time **–** When money value changes – Items that fail completely – Individual replacement and group replacement.

UNIT – 5: CLASSICAL OPTIMIZATION TECHNIQUES

Unconstrained problems – Unconstrained algorithms –Karush-Kuhn-Tucker (KKT) conditions – Quadratic programming. **Nontraditional Optimization Techniques:** Genetic algorithms – Simulated annealing – Neural network based optimization – Optimization of fuzzy systems.

Course Outcomes:

On successful completion of the course, Students will be able to		**POs related to COs**
CO1	Illustrate the fundamental concepts of optimization techniques and linear programming.	PO1,PO2,PO3
CO2	Explain the concepts of various transportation models and network models	PO1,PO3,PO4
CO3	Understand the importance and solution of inventory and queuing models	PO1,PO2,PO3
CO4	Provide solution for the problem related to decision theory	PO1, PO2,PO3, PO4
CO5	Express the knowledge on classical and modern methods of constrained and unconstrained problems in both single and multivariable	PO1, PO2, PO5

Text Books:

1. Operation Research, H.A. Taha, 2002, Prentice Hall of India.
2. Engineering Optimization: Theory and Practice Singiresu S. Rao, A Wiley, 3/e, Interscience Publication.

Reference Books:

1. Operations Research, Paneer Selvam, 2002, Prentice Hall of India.
2. Quantitative Methods for Business, Anderson, 8/e, 2002, Thomson Learning.
3. Operations Research Applications and Algorithms, Wayne.L.Winston, 4/e, 2007, Thomson learning.
4. Quantitative Techniques in Management, Vohra, 2002, Tata Mc Graw Hill.
5. Operations Research Theory and Applications, J.K.Sharma, 3/e, 2007, Macmillan India.

CO-PO Mapping

O / 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
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3		2	1	-	-	-	-	-	-	-	-
CO.3	3	2	2	-	-	-	-	-	-	-	-	-
CO.4	3	2	2	2	-	-	-	-	-	-	-	
CO.5	3	1	-	-	1	-	-	-	-	-	-	
CO	3	2	2	1.5	1	-	-	-	-	-	-	-

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III B. TECH II-SEMESTER

L	T	P	C
3	1	0	3

16OMEC323 MECHATRONICS

Course Educational Objectives:

CEO1: To understand the fundamentals of Mechatronics, Control Systems, Transducers and Sensors

CEO2: To know the functions of Mechanical, Electrical, Hydraulic, and Pneumatic Actuators in mechatronics systems

CEO3: To demonstrate the Basic system models and Controller used in Mechatronic systems

CEO4: To understand the applications of microprocessors and programmable logic controller in Mechatronic system

CEO5: To recognize the elements of Robotic system in mechatronics Engineering

UNIT – 1: MECHATRONICS, SENSORS AND TRANSDUCERS

Introduction to mechatronics systems. **Control systems:** Open loop, closed loop, automatic control, block diagram, pneumatic control and hydraulic control systems. **Transducers:** Terminology and mechanism – Classifications: Resistance, variable inductance, capacitive, piezoelectric, Hall effect and photoelectric transducers **–** Strain gauge (theory only). **Sensors:** Proximity, light and pneumatic sensors **–** Load cells – Digital optical encoders – Selection of sensors.

UNIT – 2: ACTUATION SYSTEMS

Mechanical Actuator: Types **–** Gear drive, belt drive, chain drive and bearings. **Electrical Actuator:** Types **–** Mechanical and solid state switches – Construction and working principle of stepper motor and servo motor. **Hydraulic Actuators:** Hydraulic systems – Pumps **–** Regulator – Valves – Linear and rotary actuator. **Pneumatic Actuators:** Pneumatic systems – Valves **–** Linear and rotary actuator.

UNIT – 3: SYSTEM MODELS AND CONTROLLERS

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 modes – Two step mode – Proportional mode – Derivative mode – Integral mode – PID controllers – Digital controllers – Adaptive control systems.

UNIT – 4: MICROPROCESSORS AND PROGRAMMABLE LOGIC CONTROLLER

Microprocessors: Introduction – Pin configuration **–** Architecture of 8085 – Addressing modes – Instruction set, timing diagram of 8085. **Data Acquisition:** Data acquisition systems – Analog-to- digital conversion (ADC) **–** Digital-to-analog conversion (DAC). **Programmable Logic Controller:** Introduction – Architecture – Input / output processing – Programming with timers, counters and internal relays – Data handling – Selection of PLC.

UNIT – 5: MECHATRONIC SYSTEMS

Robotic Systems: Definition – Laws of robotics – Types of industrial robotics – Robotic systems – Classification – End effectors – Robot sensors (touch, position, force, proximity and range sensors) – Robot control system – Robot drives – Industrial robots – Applications. **Mechatronics Systems:** Design process – Embedded systems –Design process of engine management system, automatic camera, automatic washing machine, pick and place robot, automatic car park barrier, wireless surveillance balloon and uninterruptible power supply.

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, PO4
CO2	Illustrate the functions of Mechanical, Electrical, Hydraulic, Pneumatic Actuators in mechatronics systems	PO1,PO2,PO3, PO4
CO3	demonstrate the Basic system models and Controller used in Mechatronic systems	PO1,PO2,PO4
CO4	Understand the applications of microprocessors and programmable logic controller in mechatronic system	PO1, PO2, PO4
CO5	Recognize the elements of Robotic system in mechatronics Engineering	PO1, PO2, PO5

Text Books:

1. A Textbook of Mechatronics, Rajput. R.K, 2007, S. Chand and Co.
2. Mechatronics, Bolton,W, 2/e, 2003, Pearson education.

Reference Books:

1. Mechatronics Systems Design, Devadas Shetty and Richard A. Kolk, 2010, Cengage Learning.
2. Mechatronics Integrated Technologies for Intelligent Machines, Smaili.A and Mrad.F, 2007, Oxford University Press.
3. Mechatronics Principles, Concepts and Applications, NitaigourPremchandMahalik, 2015, McGraw Hill Education.
4. Introduction to Mechatronics and Measurement Systems, Michael B. Histand and David G. Alciatore, 2000, McGraw-Hill International Editions.
5. Understanding Electro-Mechanical Engineering: An Introduction to Mechatronics, Lawrence J. Kamm, 2000, Prentice Hall of India Pvt., Ltd.

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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
CO.1	3	3	-	2	-	-	-	-	-	-	-	-
CO.2	3	2	2	2	-	-	-	-	-	-	-	-
CO.3	3	2	-	2	-	-	-	-	-	-	-	-
CO.4	3	2	-	2	-	-	-	-	-	-	-	
CO.5	3	1	-	-	1	-	-	-	-	-	-	
CO	3	2	2	2	1	-	-	-	-	-	-	-

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

16ECE 326 ANALOG AND 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 system in communication practically.

CEO4: To provides the practical knowledge on pulse 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 FM demodulation
4. Pre-emphasis and de-emphasis
5. Balanced Modulator & Synchronous Detector.
6. SSB Generation and Detection

PART-B: DIGITAL COMMUNICATIONS
Minimum seven experiments to be conducted:

1. Time Division Multiplexing & Demultiplexing
2. Pulse Amplitude Modulation & Demodulation
3. Pulse Width Modulation & Demodulation
4. Pulse Position Modulation & Demodulation.
5. ASK Modulator and Demodulator.
6. FSK Modulator and Demodulator.
7. PSK Modulator and Demodulator.
8. DPSK Modulator and Demodulator.

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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. Regulated Power Supply : 0-30V
2. Cathode Ray Oscilloscope: 0-20MHz
3. Digital Storage Oscilloscope
4. Function Generator: 0-1MHz
5. Lab Equipment trainer Kits for Analog and Digital Communication
6. Multimeters and Components.

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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**

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

16ECE327 MICROPROCESSOR AND EMBEDDED SYSTEM LAB

Course Educational Objectives:

CEO1: To provide knowledge on
- Fundamentals of 8086 processor
- Basic Arithmetic, logical operations.
- Fundamentals of Cross Assembler

CEO2: To become skilled in 8086 Assembly language programming

CEO3: To develop skill to understand programmable peripheral devices and their interfacing with Processor.

CEO4: To understand and learn 8051 microcontroller and its basic programming

CEO5: To develop skill to learn RTOS development Boards.

LIST OF EXPERIMENTS:

I. MICROPROCESSOR 8086:

1. Introduction to Cross Assembler /TASM
2. Arithmetic Operation-Multibyte Addition and Subtraction, Multiplication and Division, Signed and Unsigned Arithmetic Operation, ASCII-Arithmetic Operations.
3. Logic Operations-Shift Rotate-Converting Packed BCD to Unpacked BCD, BCD to ASCII Conversion.
4. By using string operation and instruction prefix: move block, reverse string, Sorting, string comparison.
5. DOS/BIOS programming: Display Characters, Strings

II.INTERFACING

1. 8279-Keyboard display: write a small program to display a string of characters.
2. 8255- Interfacing with stepper motor.
3. 8255-Interfacing with DAC to generate Triangular and Square waveform.
4. 8255-Interfacing with Traffic light controller.

III.MICROCONTROLLER 8051:

1. Arithmetic operations using 8051 microcontroller(addition,subtraction, multiplication, division)
2. Introduction to RTOS development board
   a) Write program to read input from switches.
   b) Write program to make LED's blink.

EQUIPMENT REQUIRED FOR LABORATORY:

1. 8086 MICROPROCESSOR KITS
2. 8051 MICROCONTROLLER KITS
3. INTERFACES/PERIPHERAL SUBSYSTEMS
   a) 8259 PIC
   b) 8279 KB/DISPLAY
   c) 8255 PPI
   d) 8251 USART

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Develop testing and experimental procedures on 8086 microprocessor and analyse 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 microcontrollers	PO4
CO5	Design interfacing circuits with RTOS development boards and understand the concept related to I/O devices.	PO5
CO6	Follow ethical principles in analyzing and design 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 circuits.	PO10
CO9	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**	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	**3**

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

16ECE328 ONLINE COMPREHENSIVE TEST - II

As per the Regulation 2016, There shall be two comprehensive online examinations will be conducted. One at the end of II year II Semester and the other at the end of III year, II semester, It has 100 objective questions for 100 marks on the subjects studied in the respective semesters.

A student shall acquire 1 credit assigned to the comprehensive online examination only when he/she secures 40% or more marks. In case, if a student fails in comprehensive online examination, he shall reappear at the next supplementary examination when offered.

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III B. TECH II-SEMESTER

L	T	P	C
2	0	0	0

P&T REASONING AND APTITUDE - II

Course Educational Objectives:

CEO1: To apply quantitative reasoning techniques to the real time problems.

CEO2: To understand the mathematical analysis for solve the life time 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	Solve the quantitative reasoning techniques to the real time problems	PO1,PO3,PO5,PO12
CO2	Understand the mathematical analysis for solve the life time problems	PO1,PO3,PO5,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, Abhijit Guha, 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 Mapping

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

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IV Year B.Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE 411 OPTICAL FIBER COMMUNICATIONS

Course Educational Objectives:

- To realize the significance of optical fibre communications.
- To understand the construction and characteristics of optical fibre cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and WDM.

UNIT – 1 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 – 2 Signal Degradation Optical fibers:

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Group Delay-Dispersion- Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT – 3 Fiber Optical Sources and Coupling :

Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations – External Quantum efficiency –Resonant frequencies –Temperature effects, Introduction to Quantum laser, source-to-fiber Power Launching, Lensing schemes, Fiber –to- Fiber joints, Fiber splicing.

UNIT – 4 Fiber Optical Receivers :

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors – Fundamental Receiver Operation –preamplifiers, Error Sources –Receiver Configuration – Probability of Error – Quantum Limit.

UNIT – 5

System Design and Applications: Design of Analog Systems: system specification, power budget, bandwidth budget.

Design of Digital Systems: system specification, rise time budget, power budget, Receiver sensitivity.

WDM Components: Coupler/Splitter, Isolators and Circulator, Mach Zehnder Interferometer, Fabry Perot Filter and Optical MEMS switches

OPTICAL NETWORKS: Introduction- SONET / SDH- Optical Interfaces- SONET/SDH rings- High – speed light – waveguides.

.

Course Outcomes:

CO1	Demonstrate knowledge on fundamentals of Optical Fiber Communication Fiber Losses Optical Sources and Detectors WDM components & SONET/SDH	PO1,PO2
CO2	Analyze transmission characteristics and various losses of optical fiber communications.	PO1,PO2,PO4
CO3	Analyze various characteristics of optical sources ,detectors ,couplers and connectors.	PO1, PO2
CO4	Demonstrate knowledge on optical receivers and analyze the behavior of analog and digital links.	PO1, PO2, PO4
CO5	Demonstrate knowledge on concepts of WDM and select appropriate techniques for optical amplifiers and networks.	PO1, PO2,PO5

TEXT BOOKS:

1. Optical Fiber Communication, 4th Ed., 2008, Gerd Keiser, MGH, New Delhi.
2. Optical Fiber Communications,. 3rd Impression- 2007, John M. Senior, Pearson Education, New Delhi.

REFERENCES:

1. Principles and Applications of Optical Communications, 2nd Ed., 2010, Max Ming, Kang Liu, TMH-.
2. Text book on optical fiber communication and its applications, 1st Ed., 2009, S.C.Gupta, PHI, New Delhi..
3. 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	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	2		-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	1	-	-	-	-	-	-	-	-
CO5	3	2	-	-	2	-	-	-	-	-	-	-
CO*	**2.8**	**2.6**	**-**	**1.5**	**2**	**-**	-	-	-	-	-	-

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IV B.Tech I Semester

L	T	P	C
3	1	0	3

16ECE412 DIGITAL IMAGE PROCESSING

Course Educational Objectives:

CEO1: To develop knowledge in image fundamentals and analyze the steps involved in digital image processing.
CEO2: To provide the knowledge of image transforms for different applications.
CEO3: To understand the image enhancement techniques in spatial and frequency domain
CEO4: To inculcate skills to restore the degraded image and to extract the region of interest using segmentation algorithms.
CEO5: To develop an ability to understand the image compression procedures and color image processing.

UNIT 1: 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 file formats- applications of digital image processing.
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UNIT 2: IMAGE TRANSFORMS
Unitary transform- 2-D DFT and Properties- Walsh transform- Hadamard Transform- Discrete cosine Transform - Haar transform- Slant transform- KL transform- comparison of different image transforms.

UNIT 3: IMAGE ENHANCEMNT IN THE SPATIAL AND FREQUENCY DOMAIN
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, Homomorphic filtering.
Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT 4: IMAGE DEGRADATION/RESTORATION&IMAGESEGMENTATION
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 5: IMAGE COMPRESSION & COLOR IMAGE PROCESSING
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 - transform based compression-JPEG 2000 Standards - Color models-Color image processing.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate knowledge on fundamentals of a digital image processing and analyze the different types of digital images.	PO1,PO2
CO2	Analyze spatial details of images using various transformation techniques.	PO1,PO2,PO3
CO3	Develop an appropriate technique of image enhancement in spatial and frequency domain.	PO1,PO2,PO3
CO4	Design filter for restoring the information from the degraded image. Application of the pre-defined filter for segmentation and boundary representation.	PO1,PO2,PO3
CO5	Illustrate various compression techniques, apply and analyze the concepts of color image processing.	PO1,PO2,PO3,PO4

Text Book:

1. Digital Image processing-3rd Edition- 2010-R.C. Gonzalez & R.E. Woods- Addison Wesley/ Pearson education-PHI-New Delhi.
2. Fundamentals of Digital Image processing- Eastern Economy Edition-2007- A.K.Jain - PHI-New Delhi.

Reference Books:

1. Digital image processing- 1st edtion- 2009- S.jayaraman- S.Esakkirajan- T.Veerakumar- TataMcGraw Hill. New Delhi.
2. Digital Image processing using MAT LAB -L.Edition- 2004-Rafael C. Gonzalez- Richard E Woods and Steven-PEA-New Delhi.
3. Digital Image Processing- 3rd edition- 2004- William K. Pratt- John Wilely- PHI-New Delhi.
4. Digital image processing and analysis- 1st Edtion- 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	2	3	-	-	-	-	-	-	-	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	2.8	2.4	2.75	2	-	-	-	-	-	-	-	-

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE 413 MICROWAVE ENGINEERING

COURSE EDUCATIONAL OBJECTIVES

CEO1: Concepts of microwaves.
CEO2: Operation of Microwave tubes
CEO3: Different Microwave solid state devices
CEO4: Working principle and Scattering matrix of different Waveguide components
CEO5: Microwave test bench setup for Microwave measurements.

UNIT-1: MICROWAVE TRANSMISSION LINES

Introduction - 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-2: WAVEGUIDE COMPONENTS

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-3: KLYSTRON TUBES

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-4: TRAVELLING WAVE TUBES AND MAGNETRONS

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-5:

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 - Varactor Diode - Parametric Amplifier Avalanche Transit Time Devices, PIN Diode, IMPATT and TRAPATT devices.

MICROWAVE MEASUREMENTS: 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.

Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	**Demonstrate** knowledge on the various modes of a rectangular waveguide and **analyze** various cavity resonators.	PO1, PO2
CO2	**Demonstrate** the usage of microwave components such as isolators, Couplers, Circulators, Tees, Gyrators and **analyze** the various advanced Tee junctions.	PO1, PO2
CO3	**Analyze** the principles involved in various Microwave Klystron tubes and Reflex klystrons.	PO1, PO2
CO4	**Demonstrate** the knowledge on the working principles involved in Microwave TWTs and Magnetron and analyze the characteristics of the devices.	PO1, PO2
CO5	**Demonstrate** the basic principles engaged in various Microwave solid state devices and **understand** the set up with the microwave bench for measurement of various parameters such as microwave frequency, VSWR, power, etc.	PO1, PO2

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.

REFERENCES:

1. Foundations For Microwave Engineering, 2nd Edition, 2002, R.E.Collin, IEEE Press, John Wiley.
2. Microwave Circuits And Passive Devices, 1995, M.L.Sisodia And G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd.
3. Microwave engineering passive circuits, 1999, Peter A.Rizzi, PHI.
4. Electronic and Radio Engineering, 4th Edition, 1995, F.E.Terman, McGraw-Hill, New Delhi.
5. Microwave Engineering, 2nd edition, 2009, A. Das, Tata Mc Graw Hill, New Delhi.

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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	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2	-	-	-	-	-	-	-	-	-	-

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IV Year B.Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE414A MICRO ELECTRO MECHANICAL SYSTEMS (Core Elective II)

Course Educational Objectives:
The course is designed so that students will,
CEO1: To know the major classes, components, and applications of MEMS devices/systems and to demonstrate and understand the fundamental principles behind the operation of these devices/systems
CEO2: To study the working principles of micro sensors and actuators.
CEO3: To gain fundamental knowledge on the process of standard fabrication of MEMs and to understand the steps involved in the fabrication
CEO4: To understand the concept of Bulk and Surface Micromachining, different levels of manufacturing of Microsystems.
CEO5: Design and packaging of MEMS device or a micro system.

UNIT-1: INTRODUCTION TO MICROSYSTEMS

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

Working principle of Microsystems - micro actuation techniques - micro sensors – types – Microactuators – types – micropump – micromotors – micro – valves – microgrippers – microaccelerometers.

UNIT-3: FABRICATION PROCESS

Substrates - single crystal silicon wafer formation – Photolithography – Ion implantation – Diffusion – Oxidation – CVD - Physical vapor deposition - Deposition epitaxy - etching process.

UNIT-4: MICRO SYSTEM MANUFACTURING

Bulk Micromachining - surface micromachining – 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

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:

CO	On successful completion of the course the student will be able to	PO MAPPING
CO.1	Demonstrate the development of MEMS technology and law of scaling	PO1
CO.2	Understand and analyze the operational theory of common MEMS sensors and MEMS actuators.	PO1,PO2
CO.3	Understand and analyze the micro-fabrication methods used to build/construct MEMS.	PO1, PO2
CO.4	Analyze the various levels of manufacturing process and packaging techniques.	PO1, PO2
CO.5	Design the entire micro electromechanical systems with better reliability.	PO1, PO2, PO3

TEXT BOOKS

1. MEMS and Microsystems Design and Manufacture, Tai-Ran Hsu. Tata McGraw-Hill Publishing Company Ltd.
2. Foundation of MEMS" by Chang Liu. Pearson Education.
3. Mohamed Gad – el – Hak, "MEMS Handbook", CRC Press, 2002.
4. Rai - Choudhury P. "MEMS and MOEMS Technology and Applications", PHI Learning Private Limited, 2009.
5. Sabrie Solomon, "Sensors Handbook," Mc Graw Hill, 1998.
6. Marc F Madou, "Fundamentals of Micro Fabrication", CRC Press, 2nd Edition, 2002.

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	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	3	2	2	-	-	-	-	-	-	-	-	-

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	3	**1**	**0**	**3**

16ECE414B CELLULAR MOBILE COMMUNICATIONS (Core Elective - II)

Course Educational Objectives:

CEO1: To provide knowledge on
- Understanding cellular concept
- Frequency Reuse
- Elements of cellular system

CEO2: To provide the student with an understanding of Co-channel and Non- Co-channel interference

CEO3: To inculcate skill to investigate the effect of cell coverage for signal and traffic, diversity Techniques and mobile antennas.

CEO4: To develop skill to understand frequency management, Channel assignment strategies.

CE05: To make the students familiar with mobile communication system and knowledge on Handoff, GSM architecture.

UNIT-1: CELLULAR MOBILE RADIO SYSTEMS

Introduction to Cellular Mobile system, Performance criteria, Uniqueness of Mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital cellular systems.

ELEMENTS OF CELLULAR RADIO SYSTEM

General description of problem, concept of frequency channels, Co-channel interference Reduction factor, Desired C/I from a normal case in a Omni directional Antenna system, Cell splitting , consideration of the components of cellular system.

UNIT-2: INTERFERENCE

Introduction to Co-channel interference, real time Co-channel interference, Co-channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non CO-channel interference-different types.

UNIT-3: 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, form of a point to point model.

UNIT-4: CELL SITE AND MOBILE ANTENNAS

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.

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT

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.

UNIT-5: HANDOFF AND DIGITAL CELLULAR NETWORKS

Handoff , dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation. GSM Architecture, GSM – Overview of GPRS – EDGE - VOLTE.

Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	To understand the concept of cellular communication and Elements of Cellular system	PO1, PO2
CO2	Identify various propagation effects and understand the concept of Interference both Co channel and Adjacent channel interference	PO1, PO2
CO3	Analyze the concept of Signal reflections in flat and hilly terrain , near and long distance propagation medium	PO1, PO2, PO3
CO4	Analyze various methodologies to improve the cellular capacity and knowledge on Frequency management and channel assignment	PO1, PO2, PO4
CO5	Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations	PO1

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, Prentice Hall,2002.

Reference Books:

1. Principles of Mobile communications-Gordon L.Stuber, 2nd Edition, Springer International, 2007.
2. Wireless and Mobile communications-Lee, 3rd edition, Mc Graw Hills,New delhi, 2006.
3. Wireless communications and Networking-Jon W.Mark and weihua Zhqung, PHI, 2005.
4. Wireless communication Technology-R.Blake, Thompson Asia Pvt. Ltd, 2004.
5. 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	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO*	3	2	2	2	-	-	-	-	-	-	-	-

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	3	**1**	**0**	**3**

16ECE41C ADVANCED DIGITAL SIGNAL PROCESSING (Core Elective II)

Course Objectives:

CEO1: To develop skill to analyze frequency & complex frequency representations of signals and Systems using DFT,FFT and Z-Transform, & to develop skill to design IIR filters, FIR filters.

CEO2: To get knowledge about the power spectral estimation by using Barlett, Welch & Blackmann & Tukey methods.

CEO3: To get knowledge about the power spectral estimation by using AR Models - Yule-Walker & Burg Met, MA & ARMA models .

CEO4: To illustrate the effects of finite word length implementation.

CEO5: To develop skill to apply the concept of Multi-rate signal processing in designing of various applications.

UNIT –I:

Review of DFT, FFT, IIR Filters and FIR Filters.

Introduction to filter structures (IIR & FIR).Implementation of Digital Filters, specifically 2^{nd} Order Narrow Band Filter and 1^{st} Order All Pass Filter. Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT -II:

Non-Parametric Methods:

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:

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:

Introduction, Decimation by a factor D, Interpolation by a factor 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

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.

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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 and design IIR & FIR filters for various specifications.	PO1, PO2 , PO3, PO5
CO2	Identify appropriate method and Verify the power spectral estimation for various specification.	PO1, PO2, PO3, PO5
CO3	Identify appropriate method and Verify the power spectral estimation for various specification.	PO1, PO2, PO3, PO5
CO4	Analyze the effect of word length in digital filter design and implementation.	PO1, PO2, PO4
CO5	Understand and use the concept of Multi-rate signal processing in various applications and develop filters for implementation of multirate signal processing.	PO1, 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	2	-	2	-	-	-	-	-	-	-
CO2	3	2	2	-	2	-	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-		-	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-
CO*	3	2	2	2	2	-	-	-	-	-	-	-

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IV Year B.Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE414D COMPUTER NETWORKS (Core Elective II)

Course Educational Objectives:

CEO1: Build an understanding of the fundamental concepts of transmission media, switching criteria and different Layer models.

CEO2: Familiarize the student with different protocols and its services in the networking area.

CEO3: Introduce the student to advanced networking concepts, like WLAN, Routing Algorithms and Internet.

CEO4: Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

UNIT – I

Introduction: Network Topologies, Protocols & Standards, Layered Architecture LAN, WAN, MAN. OSI Reference Model, TCP/IP Reference Model, Guided and Unguided Media.

UNIT – II

Data Link Layer: Design Issues, Framing – Error Control – Flow Control, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols, ARQ schemes, HDLC. PPP. Ethernet- IEEE 802.3,4,5 Protocols, Wireless LAN- The 802.11 Architecture and Protocol Stack-The 802.11 Physical Layer-The802.11 MAC Sublayer Protocol-The 805.11 Frame Structure-Services

UNIT – III

The Medium Access Control Sublayer-The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-CSMA Protocols-Collision-Free Protocols,

Need for Internetworking, Design Issues, Addressing, Internet Protocol (IPv4/IPv6), Virtual Circuit and Datagram Networks, Routing Algorithms, Congestion Control Algorithms.

UNIT – IV

Transport layer: UDP, TCP, Congestion Control mechanisms, QOS, Techniques to improve QOS

UNIT – V

Application Layer: Cryptography, DNS, Electronic Mail, FTP, HTTP, SNMP, DHCP

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on the basic computer network technology and *Enumerate* the layers of the OSI model and TCP/IP reference models.	PO1
CO2	Demonstrate knowledge and carryout investigation on Multiple access protocols and Wireless LANS technology.	PO1,PO4
CO3	Investigate and analyze the Network layer design issues, Routing algorithms and Congestion control algorithms.	PO1, PO2,PO4
CO4	Demonstrate knowledge on Transport layer services and various designs of the transport protocols.	PO1, PO4
CO5	Demonstrate knowledge on Domain Name System, World Wide Web and Multimedia.	PO1, PO2

TEXT BOOKS:

1. Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education.

REFERENCE BOOKS:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011
2. William Stallings, "Data & Computer Communication", Pearson Education India, 10th Edition, 2014.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach Featuring the Internet", Pearson Education,6th Edition, 2013.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	-	-		-	-	-	-	-	-	-	-
CO2	**3**	-	-	**2**	-	-	-	-	-	-	-	-
CO3	**3**	**2**	-	**2**	-	-	-	-	-	-	-	-
CO4	**3**	-	-	**1**	-	-	-	-	-	-	-	-
CO5	**3**	**2**	-		-	-	-	-	-	-	-	-
CO*	**3**	**2**	-	**1.66**	-	-	-	-	-	-	-	-

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	3	**1**	**0**	**3**

16ECE415A FPGA DESIGN (Core Elective - III)

Course Educational Objectives:

CEO1: To understand the basics of digital IC design flow, role of FPGA and tools to support the design of digital system.
CEO2: To be able to design ASM, Boolean Implementation with minimal resources.
CEO3: To acquire knowledge on timing issues, violation and analysis of issues. Designs with eliminated issues.
CEO4: To gain the knowledge and demonstrate the architectural as well as functional aspects of FPGAs.
CEO5: To apply the concepts of FPGA design in implementing various logic circuits.

UNIT 1: DESIGN WITH FPGA

Digital IC design flow - The role of FPGAs in digital design – Goals and techniques – Hierarchical design- CAD Tools.

UNIT 2: DIGITAL SYSTEM DESIGN

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

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

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

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.

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Able to demonstrate the concepts of digital ICs. Use of CAD tools in digital system design. Distinguish ASIC and FPGA.	PO1, PO2, PO3, PO4, PO5
CO2	Design a synthesizable ASMs. Implement one hot controller with comparatively minimal hardware resources.	PO1, PO2, PO3, PO4, PO5
CO3	Acquire the principles of clock, timing issues and ability to interpret among the issues. Design of synchronizers to eliminate the timing issues.	PO1, PO2, PO3, PO4
CO4	Apply the knowledge and demonstrate the architectural as well as functional aspects of FPGAs. Classification of FPGA programming.	PO1, PO2, PO4, PO5
CO5	Use commercial FPGA development tools for compilation, simulation, and synthesis and physical design flow. Classification of low power methods and Design examples.	PO1, PO2, PO3, PO4, PO5

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	2	2	2	2	-	-	-	-	-	-	-
CO2	3	2	2	2	2	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	-	2	2	-	-	-	-		-	-
CO5	3	2	2	2	2	-	-	-	-	-	-	-
CO*	3	2	2	2	2	-	-	-	-	-	-	-

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L	T	P	C
3	1	0	3

16ECE415B LOW POWER VLSI DESIGN (Core Elective III)

Course Educational Objectives:

CEO1: To identify sources of power in an IC.
CEO2: To develop skill to analyze Bi-CMOS processes, Integration and Isolation considerations.
CEO3: To develop skill to design advanced MOSFET models
CEO4: To inculcate skill to investigate the Performance Evaluation of Conventional CMOS and Bi-CMOS logic gates..
CEO5: To develop skill to apply the concept of **low power** Latches and Flip flops.

UNIT-1: LOW POWER DESIGN, AN OVER VIEW
Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.

UNIT-2: MOS/BiCMOS PROCESSES
Bi-CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process.

UNIT-3 DEVICE BEHAVIOR AND MODELING
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
Conventional CMOS and Bi-CMOS logic gates, Performance Evaluation.

UNIT-5:
LOW- VOLTAGE LOW POWER LOGIC CIRCUITS: 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.

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	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-		-	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-
CO*	3	2	2	2	2	-	-	-	-	-	-	-

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IV Year B.Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE415C MODERN DIGITAL COMMUNICATION TECHNIQUES (Core Elective III)

Course Educational Objectives:

CEO1: To provide overview & concept on fundamental signal processing and analysis of linear systems.

CEO2: To understand the communication system techniques from end-to-end, i.e., from sampling to switching and error analysis

CEO3: To develop skills on working of spread spectrum modulations system & analysis with their properties

CEO4: To know the generations of spread spectrum signals and calculate energy and bandwidth.

CEO5: To develop skills on spread spectrum receivers and applications to communication systems.

UNIT – 1: FUNDAMENTALS OF SIGNAL PROCESSING

Linear system analysis - impulse response - transfer functions and their relations - time domain and frequency domain analysis of linear systems with random inputs - system and signal bandwidth - Optimum filtering - Wiener filters - Matched filters. Representation of Band Pass Signals and Systems - Signal Space Representation - Representation of digitally modulated signals.

UNIT - 2: M-ARY MODULATION

Constant envelope Modulation techniques - MSK - GMSK - Linear and constant envelope modulation techniques – M -ary PSK - M -ary FSK - M - ary QAM – Error analysis.

UNIT - 3: SPREAD SPECTRUM MODULATION

General Concepts - Types of Spread Spectrum Signals - Analysis Of Direct Sequence - Frequency Hopping - Time Hopping and Comparisions.

Analysis of Direct Sequence Spread Spectrum Systems: Properties of PN sequences -classes of periodic sequences -properties of M -sequences - partial co -relation - spreading & dispreading of PN signals.

UNIT - 4: GENERATION OF SPREAD SPECTRUM SIGNALS

Interference rejection - output signal to noise ratio - antijam characteristics - energy and bandwidth efficiency. shift register sequence generators - discrete frequency synthesizers - generation of gold sequences and their correlation properties - generation of OVSF codes and their properties.

UNIT - 5: SYNCHRONIZATION OF SPREAD SPECTRUM SYSTEMS

Coherent Direct -Sequence Receivers - Carrier Tracking - Coherent & Non Coherent - Delay -Lock Loop Analysis - Tau -Dither Loop - Acquisition of Spread -Spectrum Signals - and Matched filters for PN Sequences - Applications of spread spectrum signals to communications.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate k**nowledge** on fundamentals of signal processing, **analyze** the linear systems in time & frequency domain and **design** wiener filters & matched filters	**PO1, PO2, PO3.**
CO2	Develop skills on M-ary modulations techniques from end-to-end, from sampling to switching and understand error **analysis**	**PO1, PO4.**
CO3	Demonstrate **knowledge** on working of spread spectrum modulations system and **analyze** their properties of different classes of periodic sequences.	**PO1, PO2.**
CO4	Understand the generations of spread spectrum signals and **calculate/formulate** SNR, energy and bandwidth for different codes such as gold codes, OVSF codes with their properties	**PO1, PO3.**
CO5	Develop skills on spread spectrum receivers, **design** a receiver to meet out the required Noise performance and applications which are used **modern** communication systems	**PO1, PO3, PO5.**

Text books:

1. Modern communications and spread spectrum , 1/e, 1986, George R. Cooper & Clare D. Mcgillem, McGraw Hill book company, New Delhi.
2. Digital communications , 4 /e, 2012, John G. Proakis, Tata McGraw Hill New delhi.

Reference books:

1. Wireless digital Communications, Modulation & Spread spectrum applications, 1/e , 1999, Dr.Kamilo Feher, PHI, New Delhi.
2. Digital communication , Fundamentals and Applications , 2/e, 2002, Bernard Sklar, Pearson Education, Noida.
3. Wireless Communications, 2/e, 2002, Theodore S. Rappaport, Pearson Education, New Delhi.
4. Communication System Engineering, 1/e, 2002, Proakis, Salehi, Prentice Hall Publications, New Delhi.
5. Digital communications, 3/e, 1995, John G. Proakis, Tata Mc Graw Hill. New Delhi.

CO-PO Mapping

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

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IV Year B. Tech I semester

L	T	P	C
3	1	0	3

16ECE415D WIRELESS COMMUNICATION NETWORKS (Core Elective III)

Course Educational Objectives:

CEO1: To provide knowledge on

- Understanding Basics of wireless communications.
- Generations of Wireless networks
- Multiple Access Schemes

CEO2: To provide the student with an understanding of Mobile IP, GSM .

CEO3: To inculcate skill to learn about different wireless data services, Access protocols.

CEO4: To develop skill to understand the architecture of Bluetooth and its protocols.

CE05: Analyse students about Wireless LAN architectures and operation.

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UNIT - I:

INTRODUCTION TO WIRELESS NETWORKING: Introduction, Difference between wireless and fixed telephonenetworks, Development of wireless networks, Traffic routing in wireless networks.

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction, FDMA, TDMA, SpreadSpectrum, Multiple Access, SDMA, Packet radio, Packet radioprotocols, CSMA protocols, Reservation protocols.

UNIT - II:

MOBILE IP& MOBILE DATA NETWORKS

Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling,Introduction, Data oriented CDPD network, GPRS and higher data rates, Short Messaging service in GSM ,Mobile application protocol.

UNIT - III:

WIRELESS DATA SERVICES: CDPD, ARDIS, RMD, Common channel signaling, 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

Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol. Introduction to WLL Technology.

UNIT-V:

WIRELESS LAN TECHNOLOGY: 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.

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
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	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-		-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2	2	2	-	-	-	-	-	-	-	-

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IV B.Tech I-Semester

L	T	P	C
3	**1**	**0**	**3**

16OSAH411 APPLICATIONS OF GRAPH THEORY
(Common to all Branches)

Course Educational Objectives:

CE01: The course is designed to equip the students with the necessary mathematical skills and techniques thatare essential for an engineering course.

CEO2: To provide knowledge on

- Graph Theory, Graph coloring
- Matrix Representation of Graphs
- Graph Based Electrical Networks
- Applications in Operations Research

CEO3: To learn the representation of graphs and understanding the Graph Isomorphism, Sub graph-Vertex degrees, Walk, Paths, Cycles-graph connection, Bipartite graphs, Trees

CEO4: To understand the Chromatic number, partitioning, Matching, covering and four colorproblem and to familiarize the knowledge of graph theory

CEO5: To understand the matrix representation of graphs, designing incidence matrix, Adjacency matrix and circuit matrix

CEO6:To identify the important graph based real time applications of electrical networks such as PLC Networks with Independent sources, LOOP circuits

CEO7: To explore the use of graphs in various applications in Operations Research such as Shortest Path between Two Points, The Travelling Salesman and Chinese Postman Problems

UNIT – 1: Graph Theory Introduction

Graph and simple graphs (Complete graphs, Complement of graph)-graph isomorphim–Sub graph-vertex degrees, walk, paths, cycles-graph connection and components-Bipartite graphs-Trees – cut edges- cut vertices-Blocks

UNIT – 2: Colouring and Directed graphs

Chromatic number-chromatic- partitioning- chromatic polynomial-Matching-covering-four color problem

Directed graphs types of directed graphs-digraphs and binary realtions –directed paths and connectedness

UNIT – 3: Matrix Representation of graphs

Introduction - Adjency matrix -Applications of Adjancy 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: Electrical Network analysis

Introduction - Kirchhoff's current and Voltage laws-Loop currents and Node Voltages- PLC Networks with Independent sources: Nodal analysis , Loop analysis .

UNIT – 5: Applications in Operation research

Introduction- Shortest Route Problems: Shortest Path between Two Points-The shortest path Problem: General case . The Travelling Salesman and Chinese Postman Problems

Reduction Based Methods for solving TSP- The Chinese Postman Problem and Matching.

Course Outcomes:

On completion of this course, a successful student is able to		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
CO2	Demonstrate knowledge in chromatic number, partitioning, matching, graph coloring, directed graphs and Develop analytical skills in solving problems involving graph coloring, partitioning and directed graphs	PO1,PO2
CO3	Demonstrate knowledge in matrix representation of graphs, designing incidence matrix, Adjacency matrix and circuit matrix and explore analytical skills in solving problems involving adjacency matrix and incidence matrix	PO1,PO2,P03
CO4	Demonstrate knowledge in significant real time applications of electrical networks such as PLC 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
CO5	Demonstrate knowledge in significant practical applications of graphs in Operations Research, explore analytical skills in solving practical problems involving using graph theory concepts and Develop skills in designing Mathematical models for real time applications including shortest path problem, Travelling Salesman problem, and The Chinese Postman Problem.	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, Narasingh Deo, 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 , Kedar Nath 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
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-		-	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-
CO*	2.6	2.4	2	2	-	-	-	-	-	-	-	-

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OSAH412 INTRODUCTION TO NANO SCIENCE AND TECHNOLOGY

Course Educational Objectives:
CEO1: To understand the importance of nanoscience and nanotechnology.
CEO2: To apply nanotechnology in the field of energy systems.
CEO3: To give prominence of nanotechnology in information technology.
CEO4: To appreciate the role of nanotechnology in electronics.
CEO5: To impart the knowledge of nanotechnology in mechanical and construction field.

UNIT – 1: INTRODUCTION TO NANO SCIENCE

Nanotechnology – Definition of nanoscale – Significance of nanoscale – Surface to volume ratio – Quantum confinement – Definition of nano materials – Types of nano materials – 1-dimentional, 2-dimentional and 3-dimentional nano materials.

UNIT – 2: FABRICATION OF NANOMATERIALS

Top-down approach – Bottom-up approach – **S**ol gel method – Physical vapour deposition – Chemical vapour deposition – Plasma arching – Ball milling – Electro-chemical deposition.

UNIT – 3: CHARACTERIZATION AND PROPERTIES OF NANOMATERIALS

Properties of materials – Physical properties – Chemical properties – Mechanical properties – Electrical properties – Thermal properties – Magnetic properties – Characterization – X-ray diffraction – UV – Visible spectroscopy.

UNIT – 4: CARBON BASED NANOMATERIALS

Nanowires and nanotubes – Carbon nanotubes – Different types of carbon nanotubes – Single walled carbon nanotubes – Multiwalled nanotubes – Fabrication of caron nanotubes – Plasma arching method – Graphene – Fullerences.

UNIT – 5: APPLICATIONS OF NANOTECHNOLOGY

Applications in material science, biology and medicine, surface science, energy and environment – Applications of quantum dots

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Course Outcomes

On successful completion of the course the student will be able to		POs related to COs
CO1	**Acquire** the basic knowledge on Nanoscience, and various types of Nanomaterials .	PO1, PO12
CO2	**Identify** appropriate method for the preparation of Nanomaterials	PO1, PO12
CO3	**Develops** skill to characterize Nanomaterials by various techniques	PO1, PO4,PO12
CO4	**Analyze** the different properties of Nanomaterials and identify their applications in various fields	PO1,PO12
CO5	**Develop** Knowledge on carbon Nanomaterials	PO1,PO12

Text Books:

1. Engineering Physics, M.R. Srinivasan, 2011, New Age International, Chennai.
2. Engineering Physics, K. Thyagarajan, 1/e, 2014, Mc Graw Hill Publishers, New Delhi.

Reference Books:

1. Nanotechnology - A Gentle Introduction to the Next Big Idea, 2003, Dorling Kindersely (India .Pvt), New Delhi.
2. Nano - The Essentials (Understanding nano Science and Nanotechnology), 2010, Tata McGraw Hill Publications.

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	-	-	2	-	-	-	-	-	-	-	1
CO4	3	-	-	-	-	-	-	-	-	-	-	1
CO5	3	-	-	-	-	-	-	-	-	-	-	1
CO*	3	-	-	2	-	-	-	-	-	-	-	**1**

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OSAH413 ENTREPRENEURSHIP DEVELOPMENT

Course Educational Objectives:

- The objective of the course is to make students understand the nature of entrepreneurship, and its importance to business.

UNIT – 1: NATURE OF ENTREPRENEURSHIP
Meaning and concepts, intrapreneurship – Entrepreneur's competencies, attitudes, qualities, functions – Types of entrepreneurs – Barriers to entrepreneurship – Entrepreneurial scenario in india and abroad – Forms of entrepreneurship – Small business, types of ownership – Role of government in the promotion of entrepreneur.

UNIT – 2: PROMOTION AND FINANCIAL ASPECTS OF THE ENTREPRENEURSHIP
Idea generation – Intellectual property rights – Financing of enterprises – Government grants and subsidies.

UNIT – 3: PROJECT PLANNING AND FEASIBILITY STUDIES
The concept of project – Project life cycle – Project planning – Feasibility – Project proposal and report preparation.

UNIT – 4: MICRO AND SMALL ENTERPRISES
Meaning and definitions – Micro and macro units – Essentials, features and characteristics – Relationship between micro and macro enterprises – Rational behind micro and small enterprises – Scope and objectives of micro and small enterprises – Enterprise and society – Role of micro enterprises in economic development – Package for promotion of micro and small-scale enterprises – Problems of micro and small enterprises.

UNIT – 5: RURAL ENTREPRENEURSHIP AND EDPs
Need – Rural industrialization – Role of NGOs – Organizing EDPs – Need, objectives and evaluation of EDPs.

Course Outcomes:

On successful completion of the course the students will be able to		**POs related to COs**
CO1	Learn entrepreneurship and role of government in the promotion of entrepreneurship	PO3, PO7, PO12
CO2	Understand an idea generation, intellectual property rights, financing of enterprises and Government grants & subsidies	PO3, PO6, PO7, PO8, PO11, PO12
CO3	Prepare project report to start a business	PO10, PO11, PO12
CO4	Choose a particular form of enterprise	PO9, PO12
CO5	Start rural entrepreneurship and learn the importance of entrepreneurship development programmes	PO9, PO12

Reference Books:

1. Entrepreneurial Development, S.S. Khanka, 4/e, 2012, S.Chand and Company Limited, New Delhi.
2. Fundamentals of Entrepreneurship, H.Nandan, 2/e, 2011, PHI publications, New Delhi.
3. Entrepreneurship, Rajeev Roy, 2/e, 2011, Oxford University Press, New Delhi.
4. Entrepreneurship, Robert D Hirsrich, Michael P Peters, Dean A Shepherd, 6/e, 2010, TMH, New Delhi.
5. The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, 6/e, 2010, Himalaya Publishing House, Mumbai.
6. Entrepreneurship Management- Text and Cases, Bholanath Dutta, 1/e, 2010, Excel Books, New Delhi.

CO-PO Mapping

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

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OCSE411 FUNDAMENTAL OF DBMS

Course Educational Objectives:

CEO1: To discuss the basic database concepts, applications, data models, schemas and instances and design Entity Relationship (E-R) model for a database.
CEO 2: To demonstrate the use of integrity constraints, relational algebra operations and relational calculus.
CEO 3: To describe the basics of SQL, construct queries using SQL, SQL functions, trigger and cursor concepts in PL/SQL
CEO 4: To understand reasoning about functional dependency and to make the students to identify the role of normalization in database management systems
CEO 5: To gain knowledge of Transaction, concurrency and recovery strategies of DBMS.

UNIT – 1: DATABASE SYSTEMS AND ENTITY RELATIONSHIP MODELING
Database system applications – Purpose of database systems – View of data – Database languages – Database users and administrators – The entity–Relationship model – Attributes and entity sets – Relationship sets – Entity – Relationship diagrams.

UNIT – 2: RELATIONAL DATA MODEL AND LANGUAGE
Introduction to the relational model – Integrity constraints – Fundamental relational algebra operations – Tuple relational calculus – Domain relational calculus.

UNIT – 3: INTRODUCTION TO SQL
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 – Introduction to nested queries – Views – Indexes – SQL functions – Database triggers.

UNIT – 4: NORMALIZATION
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
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.

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Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on Data models and Database Languages and Design 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

Text Books:

1. Database System Concepts, Korth, Silberschatz, Sudarshan, 5/e, 2006, Tata McGrawHill, New York.
2. Database Management System, Raghu Ramakrishnan, 2/e, 2000, Tata McGrawHill, New York.

Reference Books:

1. Fundamentals of Database Systems, Elmasri, Navathe, 5/e, 2008, Pearson Education, USA.
2. Database Management Systems, Peter Rob, A.Ananda Rao, Carlos Coronel, 5/e, 2003, Cengage Learning, USA.
3. SQL, PL/SQL Programming, Ivan Bayross, 2/e, 2011, BPB Publications, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, 8/e, 2004, Pearson Education, USA.
5. Fundamentals of Database Management Systems, .L. Gillenson, 1/e, 2006, MWiley, New Delhi, India.

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	-	3	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	2	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	3	-	2	2	-	-	-	-	-	-	-	-
CO*	**2.6**	**2.6**	**2.6**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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IV B.Tech I Semester

L	T	P	C
3	1	0	3

16OCSE412 BASICS OF IOT

Course Educational Objectives:

CEO1: To understand the fundamentals of internet of things.
CEO2: To learn about the basics of IoT protocols.
CEO3: To learn about building state of the art architecture in IoT.
CEO4: To learn use of devices, gateways and data management in IoT.
CEO5: To build a small low cost embedded system using raspberry Pi.

UNIT - 1: INTRODUCTION TO IOT
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 – Communication protocols – Embedded systems.

UNIT - 2: IOT AND M2M
The Vision – Introduction – From M2M to IoT – M2M towards IoT - The global context – A use case example – Differing characteristics. A market perspective – Introduction – Some definitions – M2M value chains – IoT value chains – An emerging industrial structure for IoT

UNIT - 3: IOT ARCHITECTURE
M2M high – IETF architecture for IoT – OGC architecture – IoT reference model – Domain model – Information model – Functional model – Communication model – IoT reference architecture.

UNIT - 4: M2M AND IOT TECHNOLOGY FUNDAMENTALS
Devices and gateways – Local and wide area networking – Data management – Business processes in IoT – Everything as a service (XaaS) – M2M and IoT analytics – Knowledge management.

UNIT - 5: BUILDING IOT WITH ARDUINO AND RASPBERRY PI
Building IOT with arduino – Building IoT with rasperry Pi – IoT systems – Logical design using python – IoT physical devices and endpoints – IoT device – Building blocks – Pi – Raspberry Pi interfaces.

Case study: Smart home and smart industry.

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Analyze various protocols for IoT.	PO1, PO2, PO3
CO2	Building state of the art architecture in IoT.	PO1, PO2
CO3	Design a portable IoT using rasperry Pi.	PO1, PO2, PO3,
CO4	Use of devices, gateways and data management in IoT.	PO1, PO2
CO5	Deploy an IoT application and connect to the cloud.	PO1, PO3,PO4

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, Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, 1/e, 2014, Academic Press.

Reference Books:

1. Internet of Things (A Hands-on-Approach), Vijay Madisetti and Arshdeep Bahga, 1/e, VPT, 2014.
2. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Francis da Costa, 1/e, 2013, Apress Publications.
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 - Honbo Zhou – CRC Press – 2012.

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	2	3	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	3	-	2	2	-	-	-	-	-	-	-	-
CO*	**2.6**	**2.6**	**2.6**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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L	T	P	C
3	1	0	3

16OCSE413 INFORMATION SECURITY

Course Educational Objectives:

CEO1: To understand basics of Cryptography and Network Security. Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.
CEO2: Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms.
CEO3: Analyze existing authentication and key agreement protocols; identify the weaknesses of these protocols.
CEO4: Download and install an e-mail and file security software, PGP, and efficiently use the code to encrypt and sign messages.
CEO5: Develop SSL or Firewall based solutions against security threats, employ access control techniques.

UNIT – 1: NUMBER THEORY FOR INFORMATION SECURITY

Introduction – Modular arithmetic – Prime numbers and factoring – Groups and fields defined mod primes – Euler totient function – euler's theorem – Fermat's theorem – Chinese Remainder theorem – Bit complexity.

UNIT – 2: CLASSICAL ENCRYPTION TECHNIQUES

Security attacks – Security services and mechanisms – A model for network security – Classical encryption techniques – Symmetric cipher model – Substitution techniques – Caesar cipher – Mono alphabetic cipher – Play fair cipher – Hill cipher – Transposition techniques.

UNIT – 3: BLOCK CIPHERS, DATA ENCRYPTION STANDARDS AND PUBLIC KEY CRYPTOGRAPHY

Block cipher principles – DES – AES – Block cipher design principles – Block cipher modes of operation – Public key cryptography – Principles of public key cryptosystems – RSA algorithm – Diffie-Hellman key exchange.

UNIT – 4: HASH FUNCTIONS AND DIGITAL SIGNATURES

Hash functions – Security of hash functions and MACs – Hash algorithms – SHA – HMAC – Digital signatures, digital signature standard (DSS) – Kerberos – X.509 authentication service.

UNIT – 5: IP SECURITY, INTRUDERS AND FIREWALLS

IPsec overview – Architecture – Authentication header – Encapsulating security pay load – Intruders – Intrusion detection – Firewall design and principles.

Course Outcomes:

On successful completion of this course the students should be able to		POs related to COs
CO1	Understand basics of Cryptography and Network Security.	PO1, PO2
CO2	Encrypt and decrypt messages, sign and verify messages using well known signature generation and verification algorithms.	PO1, PO2
CO3	Analyze existing authentication and key agreement protocols.	PO1, PO2, PO3, PO4
CO4	Use e-mail and file security software's.	PO1, PO2, PO3, PO5
CO5	Develop SSL/Firewall.	PO1, PO2, PO3, PO4

Text Books:

1. Cryptography and Network Security: Principles and Practices, William Stallings, 4/e, 2008, Low Price Edition, Pearson Education.
2. Network Security and Cryptography, Bernard Menezes, 1/e, 2010, Thomson Press Ltd, USA.

Reference Books:

1. Principles and Practices of Information Security, Michal E. Whitman and Herbert J. Mattord, 4/e, 2012, Cengage Learning, New Delhi.
2. Network Security Essentials (Applications and Standards), William Stallings, 4/e, Pearson Education.
3. Hack Proofing Your Network, Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik and Ryan Permeh, 2/e, 2002, wileyDreamtech.
4. Fundamentals of Network Security, Eric Maiwald 1/e, 2008, Dreamtech press.
5. Network Security - Private Communication in a Public World, Charlie Kaufman, Radia Perlman and Mike Speciner, 2/e, 2002, Pearson/PHI.

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	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	3	-	-	-	-	-	-	-	-
CO4	2	3	2	-	3	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	**2.6**	**2.4**	**2.3**	**2.5**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OCIV411 TRANSPORT AND ENVIRONMENT

Course Educational Objectives:

PEO1: To impart knowledge on different concepts of Environmental Impact Assessment.
PEO2: To learn the EIA methodologies and the criterion for selection of EIA methods.
PEO3: To identify impact of air, water and land due to developmental activities
PEO 4: To know the procedures for environmental audit and some case studies.

UNIT – 1: INTRODUCTION
Environmental inventory, environmental assessment, environmental impact assessment (EIA), environmental impact of transportation projects, need for EIA, EIA guidelines for transportation project, historical development.

UNIT – 2: METHODOLOGIES
Elements of EIA – Screening and scoping – Methods of impact analysis – Applications – appropriate methodology.

UNIT – 3: ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT
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
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
EIA case studies on highway, railway, airways and waterways projects.

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Understand the basic concept of EIA	PO1
CO2	Analyse and Select the appropriate EIA methodology	PO1
CO3	Learn the impact of soil ,air and water due to developmental activities and analyze guidelines	PO1,PO3
CO4	Understand environmental audit procedure	PO1, PO3,PO6
CO5	Analyze case studies and Apply concepts of EIA	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, Priya Ranjan Trivedi, 1998, New Delhi, Hyderabad: Indian Green Building Council.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	2	-	-	-	-	-	-
CO5	2	-	2	-	-	2	-	-	-	-	-	-

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OCIV412 DISASTER MANAGEMENT

Course Educational Objectives:

CEO1: Learn various hazards and vulnerabilities in India

CEO2: Lear scientific approach to manage disasters

CEO3: Understand various disaster mitigation and management plans in India

UNIT – 1: INTRODUCTION TO DISASTERS

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.

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UNIT – 2: APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle – Phases, culture of safety, prevention, mitigation and preparedness community based 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

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

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

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.

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Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Describe basic features of disasters and classify them	PO1, PO7
CO2	Explain scientific approach to disaster risk reduction	PO1, PO7
CO3	Express the relation between the disaster and development	PO1, PO7
CO4	Describe disaster mitigation plan in India	PO1, PO7
CO5	Analyze case studies related to disaster and draw conclusions	PO1, PO2, PO7

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, Kapur Anu 2010, IIAS and Sage Publishers, New Delhi.

CO-PO Mapping

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

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OCIV413 AIR POLLUTION AND CONTROL ENGINEERING

Course Educational Objectives:

CEO 1:To provides the knowledgeabout the various sources of Airpollution and itseffects on humanbeings , Vegetation and Materials.

CEO 2: To Analyse various the air pollutant dispersion models

CEO 3: To provideknowledgeaboutcontrolmethods and details of control equipments

CEO 4: To demonstrateVarious sources of Noisepolltion and controlmeasures

UNIT – 1: INTRODUCTION

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

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

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

Factors affecting selection of control equipment – Working principle, design and performance equations of absorption, adsorption, condensation, incineration, bio scrubbers, bio filters – Process control and monitoring – Operational considerations.

UNIT – 5: INDOOR AIR QUALITY MANAGEMENT

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

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO 1	Identify the major sources of air pollution and understand their effects on health and environment.	PO1, PO7
CO 2	Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models	PO2, PO3
CO 3	Design the control techniques for particulate and gaseous emissions	PO1, PO3
CO 4	Understand the standards of air quality and legal framework	PO1, PO6
CO 5	Identify the major sources of noise pollution, effects and control measures	PO1, P07

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, Mc Graw Hill, New York.

CO-PO Mapping

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

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OEEE411 ENERGY AUDITING & DEMAND SIDE MANAGEMENT

Course Educational Objectives:

CEO1: To know auditing, conservation of energy
CEO2: To know about various energy efficient motors and ratings
CEO3: To know about various lighting systems for conservation of energy
CEO4: To know methods of improving power factor
CEO5: To know about demand side management

UNIT - I INTRODUCTION

Energy situation – world and India, energy consumption, conservation, Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes-audit procedure.

UNIT - II ENERGY EFFICIENT MOTORS

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.

UNIT - III POWER FACTOR IMPROVEMENT & LIGHTING AND ENERGY INSTRUMENTS

Power factor – methods of improvement, location of capacitors, Pf with non linear loads, effect of harmonics on p.f., p.f motor controllers.-synchronous condencers.Good lighting system design and practice, lighting control ,lighting energy audit - Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tong testers

UNIT – IV ENERGY ECONOMIC ANALYSIS

The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems.

UNIT – V DEMAND SIDE MANAGEMENT

Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning. Load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation.

Course Outcomes:

On successful completion of the course, student will be able to		POs related to COs
CO1	Student can perform auditing of various energy consuming loads	PO1, PO2
CO2	Implement and find location of capacitor ratings	PO1, PO2, PO3
CO3	Evaluate Energy Economics in power systems.	PO1, PO2,PO4
CO4	Analyze good lighting system design and practice	PO1, PO2, PO4
CO5	Can implement demand side management	PO1, PO2

TEXT BOOK:

1. Industrial Energy Management Systems, Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York.
2. Fundamentals of Energy Engineering - Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey.
3. Electrical Power distribution, A S. Pabla, TMH, 5th edition, 2004
4. Demand Side Management, Jyothi Prakash, TMH Publishers.

REFERENCES:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann publications.
2. Energy management by Paul o‘ Callaghan, Mc-graw Hill Book company-1st edition, 1998
3. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-
4. Energy management hand book by W.C.Turner, John wiley and sons
5. Energy management and good lighting practice : fuel efficiency-booklet12-EEO

CO-PO Mapping

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

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IV B. TECH -I SEM (E.E.E)

L	T	P	C
3	1	0	3

16OEEE412 FUNDAMENTALS OF ELECTRICAL ESTIMATION AND COSTING

Course Educational Objectives:

CEO1: To know estimating and costing aspects of all electrical equipment
CEO2: To know about design and estimation of wiring.
CEO3: To know about design of overhead and underground distribution lines.
CEO4: To know about different types of substations
CEO5: To know about design of illuminations.

UNIT-I DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS:

Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations. Load calculation and selection of cables for single phase and three phase system.

UNIT —II ELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES:

Electrical installations for residential buildings -estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries-street lighting estimation ,cables for domestic applications.

UNIT—III OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES:

Introduction, Supports for transmission lines, Distribution lines — Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT-IV SUBSTATIONS:

Introduction, Types of substations, Outdoor substation — Pole mounted type, Indoor substations — Floor mounted type.

UNIT-V DESIGN OF ILLUMINATION SCHEMES:

Introduction, Terminology in illumination, laws of illumination, various types of light sources, Practical lighting schemes.

Course Outcomes:

On successful completion of course, student will be able to		POs related to COs
CO1	perform estimating and costing of all electrical equipment	PO1
CO2	Design and estimation of wiring.	PO1, PO2
CO3	Design of overhead and underground distribution lines	PO1
CO4	Know the different types of Outdoor substation.	PO1
CO5	Understand the Illumination Schemes.	PO1

TEXT BOOKS

1. Electrical Design Estimating and Costing, K. B. Raina, S. K. BhattAcharya, New Age International Publisher.
2. Design of Electrical Installations, Er. V. K. Jam, Er. Amitabh Bajaj, University Science Press.
3. Electricity Pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P. E., CRC Press.

REFERENCE BOOKS

1. Code of practice for Electrical wiring installations,(System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.
4. Code of Practice for selection, Installation of Maintenance of fuse (voltage not exceeding 650V), Indian Standard Institution, IS: 3106- 1966.
5. Code of Practice for earthling, Indian Standard Institution, lS:3043- 1966.

CO-PO Mapping

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

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B.TECH IV-I SEM (E.E.E)

L	T	P	C
3	1	0	3

16OEEE413 FUNDAMENTALS OF ELECTRICAL POWER UTILIZATION

Course Educational Objectives:

CEO1: To comprehend the different issues related to heating, welding
CEO2: To know about illuminations.
CEO3: To know about types of drives used in traction and techniques for braking system implementation
CEO4: To know about electrical drives
CEO5: To provide the students the fundamental concepts of electrolytic process

UNIT - 1: ELECTRIC HEATING AND WELDING

Electric Heating- Advantages and methods of electric heating - Resistance heating - Arc heating - Induction heating and dielectric heating - Infrared or radiant heating.Electric Welding- Definition of welding - Welding process - Resistance and arc welding – electric welding equipment, comparison between AC and DC welding.safty precautions' during welding.

UNIT - 2: ILLUMINATION

Introduction - Terms used in illumination -Laws of illumination - Polar curves - Photometry - Sources of light - Lamps: Incandescent lamps - Discharge lamps - SV and MV lamps - Lighting schemes- Requirement of good lighting scheme –Types and design of lighting schemes - calculation of illumination- Illumination standards for domestic ,industrial and sports complexes -Numerical problems.

UNIT - 3: ELECTRIC TRACTION-I

Introduction- Systems of electric traction - Comparison between A.C. and D.C. traction - Special features of traction motor- Methods of electric braking- Rheostat braking and regenerative braking - Speed-time curves for different services – Trapezoidal and quadrilateral speed time curves - Numerical problems.

UNIT - 4: ELECTRIC DRIVES

Introduction - Type of electric drives - Selection of electrical drives - Types of industrial loads - Continuous - Intermittent and variable loads - Starting and running characteristics - Speed control of motors - Size and rating of motors - Temperature rise - Load equalization - Motors for particular application.

UNIT - 5: ELECTROLYTIC PROCESS

Electrolysis, Faradays laws, application of Electrolysis, power supply for Electrolysis-VFD drives for different applications-soft starters for different applications- starters for different loads.

Course Outcomes:

	On successful completion of course, student will be able to	POs related to COs
CO1	Articulate different types of Electric Heating, welding and Illumination	PO1
CO2	Design Electric Traction	PO1, PO2
CO3	Discuss mechanics of Train movement.	PO1
CO4	Plot trapezoidal and quadrilateral speed time curves.	PO1, PO2
CO5	Discuss specific energy consumption.	PO1

TEXT BOOKS:

1. Utilization of Electrical Energy , 1/e 2007 ,Open Shaw Taylor , Orient Longman-Hyderabad.

2. Utilization of Electric power , 1/e 2006 ,R K Rajput , Lakshmi Publications – New Delhi.

REFERENCE BOOKS:

1. Utilization of Electric power and Electric traction , 10 /e 2009 J B Gupta , S K kataria and sons Publications – New Delhi.
2. Utilization of Electrical Energy ,1/e 2010 ,Tarlok Singh, S. K. Kataria and Sons - New Delhi.
3. Generation & Utilization of Electrical Energy , 1/e 2010,S. Sivanagaraju, M. Balasubba Reddy and D. Srilatha , Dorling Kindersly.Pvt Ltd – UP, INDIA.
4. Generation Distribution & Utilization of Electrical Energy ,3/e 2012 , C. L. Wadhwa , New Age Publications ,New Delhi.

CO-PO Mapping

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

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16OMEC411 QUALITY CONTROL AND RELIABILITY ENGINEERING

Course Educational Objectives:

CEO1: To understand basic TQM Principles adopted in statistical process control engineering.

CEO2: To estimate the quality control of a product by using control charts and Process capability.

CEO3: To know the techniques involved in the acceptance sampling and procedure

CEO4: To learn the concepts of Reliability engineering and Failure data analysis.

CEO5: To understand the fundamental principles of reliability estimation and product development.

UNIT – 1: TQM PRINCIPLES AND STATISTICAL PROCESS CONTROL

Introduction – Need for quality – Definition of quality – Dimensions of manufacturing and service quality – Basic concepts of TQM – Definition of TQM – TQM frame work – Contributions of Deming – Leadership – Strategic quality planning – Quality cost – 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 – Seven SPC tools – Histogram, check sheets, Ishikawa diagrams, pareto, scatter diagrams, control charts and flow chart.

UNIT – 2: QUALITY CONTROL

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 and process capability studies - Concepts in six sigma.

UNIT – 3: ACCEPTANCE SAMPLING

Lot by lot sampling – Types – Probability of acceptance in single, double, multiple sampling techniques – OC curves – Producer's risk and consumer's risk – AQL, LTPD, AOQL concepts – Standard sampling plans for AQL and LTPD – Uses of standard sampling plans.

UNIT – 4: RELIABILITY CONCEPTS

Reliability engineering – Fundamentals – Failure data analysis, mean failure rate, mortality curve concept of burn – In period, useful life and wear out phase of a system, mean time to failure, mean time between failure, hazard rate – Failure density and conditional reliability – Maintainability and availability – Simple problems.

UNIT – 5: RELIABLITY ESTIMATION

System reliability – Series, parallel and mixed configurations, reliability improvements techniques use of pareto analysis – Design for reliability – Redundancy unit and standby redundancy – Fault tree analysis – Optimization in reliability – Product design – Product analysis – Product development – Product life cycles.

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand basic TQM Principles adopted in statistical process control engineering	PO1,PO2, PO3
CO2	Demonstrate the quality control of a product by using control charts and Process capability.	PO1,PO2,PO3, PO4
CO3	Understand the techniques involved in the acceptance sampling and procedure	PO1,PO2,PO4
CO4	Explain the concepts of reliability engineering and failure data analysis.	PO1, PO2, PO4
CO5	Understand the fundamental principles of reliability estimation and product development	PO1, PO2, PO3, PO5

Text Books:

1. Quality Control, Besterfield D.H., 8/e, 2009, Prentice Hall.
2. Reliability Engineering, Srinath. L.S., 4/e, 2005, Affiliated East west press.

Reference Books:

1. Statistical Quality Control, Monohar Mahajan, 2001, Dhanpat Rai &and Sons.
2. Practical Reliability Engineering, Connor, P.D.T.O., 2008, Wiley India.
3. Introduction to Statistical quality control, Douglas.C. Montgomery, 7/e, 2012, John Wiley.
4. Reliability Engineering, Kailash C. Kapur and Michael Pecht, 2014, John Wiley.
5. Statistical Process Control, John.S. Oakland. 5/e, 2005, Elsevier.

Codes/Tables: Use of approved statistical control table permitted in the examination.

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
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	2	2	2	-	-	-	-	-	-	-	-
CO.3	3	2	-	2	-	-	-	-	-	-	-	-
CO.4	3	2	-	2	-	-	-	-	-	-	-	
CO.5	3	1	2	-	2	-	-	-	-	-	-	
CO	**3**	**2**	**2**	2	2	-	-	-	-	-	-	-

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IV B.Tech I Semester

L	T	P	C
3	1	0	3

16OMEC412 INDUSTRIAL ENGINEERING AND PSYCHOLOGY

Course Educational Objectives:

CEO1: To understand basic concepts of management and contributions of management gurus.
CEO2: To recognize the types of organizations and plant layout
CEO3: To know the techniques involved in the Work study in industry perspective.
CEO4: To learn the concepts of production planning and control in an industry.
CEO5: To learn the fundamental concepts of industrial psychology and personnel management.

UNIT – 1: CONCEPTS OF MANAGEMENT

Management: Administration – Organization – Importance and characteristics – Managerial skills – Differences between polices, goal and objectives – Scientific management – Management contribution of FW Taylor, Henry Foyal and Gilberth – Principles of management – Process of management – Functions of management – Levels and types management – Management chart – Management development – Project management – Management information system – Industrial ownership – Responsibilities of supervisor/foreman – Leadership concepts and qualities.

UNIT – 2: ORGANIZATIONS AND PLANT LAYOUT

Organization: Concept, importance, characteristics, elements and process of organization – organization theory – Principle of organization – Organization structure and chart – Types of organization – Committees – Project and matrix organization – Departmentation – Authority and delegation – Group dynamics – Organizational change, conflict and development – Managerial leadership and Communication system. **Plant Layout:** Types of layout – Flow pattern – Storage space – Plant layout procedure – Consideration in building design – Production and productivity.

UNIT – 3: WORK STUDY

Definition and need – Advantages and objectives – Method study – Process chart symbols – Flow process chart – Flow diagram – String diagram – Multiple activity chart – Operation analysis – Principles of motion economy – Design of work place – Therbligs – SIMO chart – Time study – Standard data – Analytical estimating – PMTS – Ergonomics.

UNIT – 4: PRODUCTION PLANNING AND CONTROL

Introduction – Continuous and intermittent production – Job, open and closed job shop – One time large projects – Forecasting – Process planning – Economical batch quantity – Tool control – Loading – Scheduling – Control of production – Dispatching – Routing – Progress control – Flow control – Line of balance.

UNIT – 5: INDUSTRIAL PSYCHOLOGY AND PERSONNEL MANAGEMENT

Industrial Psychology: Definition and concept – Aim, scope and objectives – Individual and group – Group dynamics – Hertzberg's two factor theory of motivation - Maslow's hierarchy of human needs – Theory of X and Y – Hawthorne experiment – Morale – Motivation – Working and environmental condition – Industrial fatigue. **Personnel Management:** Definition and concept – Objectives and principles of personnel – Recruitment and selection – Training – Safety and welfare –measures – Housekeeping – Communication – Promotion, lay-off, transfer and discharge.

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Demonstrate the basic concepts of management and contributions of management gurus	PO6, PO12
CO2	Recognize the types of organizations and plant layout	PO1,PO6,PO7
CO3	Understand the techniques involved in the Work study in industry perspective.	PO1,PO2,PO5
CO4	Explain the concepts of production planning and control in an industry.	PO1, PO2, PO4
CO5	Understand the fundamental concepts of industrial psychology and personnel management	PO6, PO8, PO9, PO12

Text Books:

1. Industrial Engineering and Management, O.P. Khanna, 17/e, 2010, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Manufacturing Organization and Management, Amrine, 2/e, 2004, Pearson Education, New Delhi.

Reference Books:

1. Industrial Engineering and Organization Management, S.K.Sharma, Savita Sharma, 1/e, 2011, S.K.Kataria and Sons Publications, New Delhi.
2. Industrial Engineering and Management, RaviShankar, 2/e, 2009, Galgotia Publications, New Delhi.
3. Production and Operations Management, PanneerSelvam, 3/e, 2012, Pearson Education, New Delhi.
4. Motion and Time Study: Design and Measurement of work, Ralph M Barnes, 7/e, 2009, Wiley India Pvt, Ltd., New Delhi.
5. Operations Management, Chase, Jacobs, Aquilano, 10/e, 2003, Tata McGraw-Hill Education Pvt. Ltd., Noida.

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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
CO.1	-	-	-	-	-	3	**-**	-	-	-	-	**2**
CO.2	3		-	-	**-**	3	**2**	-	-	-	-	-
CO.3	2	2	-	-	2	-	-	-	-	-	-	-
CO.4	3	3	**-**	2	**-**	-	-	-	-	-	-	-
CO.5	**-**	**-**	**-**	**-**	**-**	3	**-**	1	**2**	-	-	2
CO	**2.6**	**2.5**		2	2	**2**	**2**	1	2	-	-	**2**

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IVB.Tech I Semester

L	T	P	C
3	1	0	3

16OMEC413 POWER GENERATION TECHNOLOGIES

Course Educational Objectives:

CEO1: To understand working principles of steam power plant & working circuits of the plant .
CEO2: To recognize plant layout of Hydro electric, Diesel and Gas turbine power plants
CEO3: To know the safety measures & environmental aspects of nuclear power plant
CEO4: To learn the concepts of all types of renewable energy power plants.
CEO5: To learn the economics of power generation

UNIT – 1: STEAM POWER PLANTS

Plant layout – Working of different circuits – Types of coal – Properties of coal – Coal handling system – Ash handling system – Feed water treatment – Stages of combustion – Pulverized coal firing system – Cyclone furnace – Fluidized bed combustion system – Cooling towers and heat rejection.

UNIT – 2: HYDRO ELECTRIC, DIESEL AND GAS TURBINE POWER PLANTS

Hydro Electric Power Plants: Energy scenario – Global and national – Essential elements and classification of hydro power plants – Typical layout and associated components – Selection of turbines – Pumped storage plants. **Diesel and Gas Turbine Power Plants**: Layout and functioning – Environmental impact and control.

UNIT – 3: NUCLEAR POWER PLANTS

Layout and subsystems – Fuels and nuclear reactions – Boiling water reactor, pressurized water reactor, fast breeder reactor, gas cooled and liquid metal cooled reactors – Working and comparison – Safety measures – Environmental aspects.

UNIT– 4: RENEWABLE ENERGY POWER PLANTS

Solar power plants – Photovoltaic and thermal – Wind energy – Horizontal and vertical axis wind turbine (HAWT & VAWT) – Geo thermal– Tidal energy – Ocean thermal – Biogas – Fuel cell, thermoelectric and thermionic generation.

UNIT – 5: ECONOMICS OF POWER GENERATION

Load and load duration curves – Electricity billing – Costing of electrical energy – Tariff structures – Economics of power plant – Fixed and variable cost – Payback period – Net present value, internal rate of return – Emission calculation and carbon credit.

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand working principles of steam power plant & working circuits of the plant	PO1, PO2
CO2	Recognize plant layout of Hydro electric, Diesel and Gas turbine power plants	PO1,PO2,PO3
CO3	Explain the safety measures & environmental aspects of nuclear power plant	PO1,PO6,PO7
CO4	Discover the concepts of all types of renewable energy power plants.	PO1, PO4, PO5
CO5	Learn the economics of power generation	PO1, PO6

Text books:

1. Power Plant Engineering, P.K.Nag, 4/e, 2015, McGraw-Hill Education Pvt. Ltd., New Delhi.
2. A Course in Power Plant Engineering, Arora and S. Domkundwar, 6/e, 2012, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

Reference books:

1. Text of Power Plant Engineering, P.C.Sharma, 9/e, 2013, S.K.Kataria and Sons Publications, New Delhi.
2. A Text Book of Power Plant Engineering, Rajput. R.K., 4/e, 2012, Laxmi Publications (P) Ltd., New Delhi.
3. Power Plant Engineering, K.K.Ramalingam, 1/e, 2010, Scitech Publishers, Chennai.
4. Power Plant Engineering, Nagpal G. R., n/e, 2004, Khanna Publisher, New Delhi.
5. Introduction to Power Plant Technology, G.D.Rai, 3/e, 2012, Khanna Publishers, 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	PO 10	PO 11	PO 12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	3	2	2	-	-	-	-	-	-	-	-	-
CO.3	3	-	-	-	-	2	**2**	-	-	-	-	-
CO.4	3	-	-	2	2	-	-	-	-	-	-	
CO.5	3	-	-	-	-	2	-	-	-	-	-	
CO	**3**	**2**	**2**	2	2	**2**	**2**	-	-	-	-	-

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

16ECE416 MICROWAVE AND 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.

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

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Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on MICROWAVE BENCH and GUNN setup.	PO1
CO2	Analyze the modes from Reflex Klystron Characteristics Gunn diode characteristics, waveguide parameters, Insertion loss, Isolation and fixed attenuators, Directional coupler, Magic TEE.	PO2
CO3	Follow ethical principles in analyzing the different microwave components and optical parameters.	PO8
CO4	Do experiments effectively as an individual and as a member in a group.	PO9
CO5	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO6	Continue updating their skill related to Optical and Microwave communications in 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**

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IV B.TECH I SEMESTER	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

16ECE417 DIGITAL SIGNAL AND IMAGE PROCESSING LAB

Course Educational Objectives:

CEO1: To 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 analyze the image smoothening and sharpening.

List of Experiments:

1) Introduction to MATLAB.
2) MATLAB program to image manipulation and some conversions between different formats.
3) MATLAB program to generate continuous and discrete signal, and sum of sinusoids.
4) MATLAB program for image transforms using DCT.
5) MATLAB program for image enhancement using point processing and gray level transformation.
6) MATLAB program for image segmentation using thresholding.
7) MATLAB program for image compression using BTC.
8) MATLAB program for Homomorphic filtering.
9) MATLAB program for color image processing.
10) MATLAB program to find the frequency response of analog LP/HP filters.
11) Image smoothening in spatial and frequency domain
12) Image sharpening in spatial and frequency domain

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Course Outcomes

On successful completion of the course the student will be able to		POs related to COs
CO1	*Acquire* the knowledge on MATLAB tool and Understand modern tool usage for signal and Image processing techniques	PO1
CO2	Analyze the functionality of different fundamental steps such as Image enhancement, Image segmentation and Image compression.	PO2
CO3	Develop algorithms using different image processing techniques.	PO3
CO4	Conduct investigation and test the functionality on implementation of image smoothening and sharpening.	PO4
CO5	Follow ethical principles in analyzing and implementing various base band and band pass modulation techniques	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 skill related to communication 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**

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IV Year B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE421 SATELLITE COMMUNICATION

Course Educational Objectives:

CEO1: To provide knowledge on principles of Satellite Communication and Orbital Mechanics
CEO2: To develop skill to analyze the space segment components of satellite
CEO3: To acquire knowledge for analysis and preparation of Link Budget for a specified C/N ratio.
CEO4: To be able to develop the skills, analyze and design earth station antennas and equipments
CEO5: To understand the concept of satellite navigation and GPS system principles

UNIT – 1: OVERVIEW OF SATELLITE SYSTEMS

Introduction- Basic concepts of Satellite communications- Frequency allocations for satellite systems. Advantages and applications of satellite communications over other communications

ORBITAL ASPECTS OF SATELLITE COMMUNICATIONS

Orbitals- Mechanics- look angle determination- orbit perturbations- Orbital determination- launches and launch vehicles- orbital effects in communication systems performance.

UNIT – 2: THE SPACE SEGMENT

Introduction- spacecraft subsystems- attitude and orbit control systems- Telemetry- tracking and command- power systems- communication subsystems.

UNIT – 3: SATELLITE LINK DESIGN

Basic transmission theory- system noise temperature and G/T ratio- Design of down links- up link design- design of satellite link for specified C/N.

UNIT – 4: EARTH STATION TECHNOLOGY

Earth station design- Design of large antennas- Tracking- Small earth station Antennas- equipment for Earth stations.

UNIT – 5: SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM:

Radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, GPS navigation message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, differential GPS.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Demonstrate knowledge on basic concepts in satellite communication and application over other communication systems. Discuss the orbital mechanics and launch methodologies	PO1,PO2
CO2	Demonstrate knowledge on various space subsystems and explain the different subsystems of earth segment.	PO1,PO2
CO3	Demonstrate knowledge on basic transmission theory, system noise temperature. Design of down links and up links for satellite communication.	PO1,PO2,PO3
CO4	Design and development of large antennas and tracking the small earth station Antennas for communication.	PO1,PO2,PO3
CO5	Demonstrate knowledge on various satellite applications and explain some of its uses in real time.	PO1,PO2,PO5

Text Books:

1. Satellite Communications, 2nd Edition, 2006, Timothy Pratt, Charles Bostian, JeremyAllnutt, John willey india, New Delhi.
2. Satellite Communications, 4th Edition, 2001, Dr D.C. Agrwal, KHANNA, Delhi.

References:

1. Satellite Communication systems Engineering, 2nd Edition, 2003, W. L. Pritchard, H. G. Suyderhoud and R. A. Nelson, Pearson, New Delhi.
2. Satellite Communications, 3rd Edition, 2001, Dennis Roddy,Mc Graw Hill, Intenational.
3. Satellite Communications, 1st Edition, 2000, Robert M Gagliardi, CBS, New Delhi.
4. Fundamentals of Satellite Communication, 1st Edition ,2006, K N Raja Rao, Prentice-Hall of india, New Delhi.
5. Satellite Communications, 1st Edition, 2009, V S Bagad, Technical publications, Pune

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
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	2	2	3	-	-	-	-	-	-	-	-	-
CO.4	2	2	3	-	-	-	-	-	-	-	-	-
CO.5	3	2	-	-	3	-	-	-	-	-	-	-
CO	2.6	2.4	3	-	3	-	-	-	-	-	-	-

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IV Year B. Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE422 RADAR SYSTEMS

Course Educational Objectives:

CEO1: To provide knowledge on

- RADAR working principle
- Fundamentals of RADAR
- Frequencies and Applications
- RADAR Range Equation

CEO2: To analyze the Doppler Effect, CW and Frequency Modulated Radar and understand the concept of FM-CW Radar, FM-CW altimeter, Multiple Frequency CW Radar.
CEO3: To develop the knowledge on MTI and Pulse Doppler radars, delay line canceller filter characteristics, MTI Radar Parameters.
CEO4: To understand the concept of Tracking Radar, its types and Comparison of Tracking RADARs.
CEO5: To analyze the Radar Receivers performance in presence of Noise, and familiarizing the concepts of Duplexers, Beam Steering and Beam Width changes, feeders, displays used in RADAR systems.

UNIT 1: BASICS OF RADAR AND RADAR EQUATION

Introduction - Maximum Unambiguous Range - Simple form of Radar Equation - Radar Block Diagram and Operation - Radar Frequencies and Applications - Prediction of Range Performance - Minimum Detectable Signal - Receiver Noise - Modified Radar Range Equation – SNR - Envelope Detector - False Alarm Time and Probability - Integration of Radar Pulses - Radar Cross Section of Targets (simple targets – sphere - cone-sphere) - Transmitter Power - PRF and Range Ambiguities - System Losses (qualitative treatment) - Illustrative Problems.

UNIT 2: CW AND FREQUENCY MODULATED RADAR

Doppler Effect - CW Radar – Block Diagram - Isolation between Transmitter and Receiver- Non-zero IF Receiver - Receiver Bandwidth Requirements - Applications of CW radar - Illustrative Problems - FM-CW Radar- Range and Doppler Measurement- Block Diagram and Characteristics (Approaching/ Receding Targets) - FM-CW altimeter - Multiple Frequency CW Radar.

UNIT 3: MTI AND PULSE DOPPLER RADAR

Introduction – Principle - MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter - Delay Line Cancellers – Filter Characteristics - Blind Speeds - Double Cancellation - And Staggered PRFs - Range Gated Doppler Filters - MTI Radar Parameters - Limitations to MTI Performance - MTI versus Pulse Doppler radar.

UNIT 4: TRACKING RADAR

Tracking with Radar - Sequential Lobing - Conical Scan - Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and twocoordinates) - Phase Comparison Monopulse - Tracking in Range - Acquisition and Scanning Patterns - Comparison of Trackers.

UNIT 5: DETECTION OF RADAR SIGNALS IN NOISE AND RADAR RECEIVERS

Introduction - Matched Filter Receiver – Response Characteristics and Derivation - Correlation Function and Cross-correlation Receiver - Efficiency of Non-matched Filters - Matched Filter with Non-white Noise - Noise Figure and Noise Temperature - Displays – types - Duplexers – Branch type and Balanced type - Circulators as Duplexers - Introduction to Phased Array Antennas – Basic Concepts - Radiation Pattern - Beam Steering and Beam Width changes - Series versus Parallel Feeds - Applications - Advantages and Limitations.

Course Outcomes:

On successful completion of the course the student will be able to,		PO MAPPING
CO.1	Demonstrate the knowledge of fundamental concepts and terminology in RADAR, Analyze and design the Radar range through RADAR Range equation in various forms.	PO1, PO2, PO3
CO.2	Apply the Doppler Effect concept in CW RADAR and FM CW RADAR.	PO1, PO2
CO.3	Demonstrate knowledge on operation of MTI and pulse Doppler radar and analyze the delay line canceller filter characteristics	PO1, PO2
CO.4	Understand the RADAR concept to tracking radar systems and comparing different RADAR Trackers.	PO1, PO2
CO.5	Analyze RADAR signal reception in presence of NOISE and understand the Receiver concepts	PO1, PO2, PO3

TEXT BOOKS:

1. Introduction to Radar Systems, 2nd Edition, 2007, Merrill I. Skolnik, TMH Special Indian Edition.

2. Introduction to Radar Systems, 3rd Edition, 2001, Merrill I. Skolnik, Tata MC-Graw Hill.

REFERENCES:

1. Understanding Radar Systems, 1992, Simon Kigsley, Tata Mc-Graw Hill, UK.

2. Radar Principals, Technology, Applications, 2004, Byron Edde, Pearson Education, New Delhi.

3. Radar Principles, 1998, Peyton Z. Peebles, John Wiley & Sons, NewYork.

4. Radar Systems, 1st Edition, 2008, V.S. Bagad, Technical Publications, Pune.

5. Microwave and Radar Engineering, 2003, M. Kulakarni, Umesh Publications.

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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
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	2	-	-	-	-	-	-	-	-	-	-
CO.3	3	2	-	-	-	-	-	-	-	-	-	-
CO.4	3	1	-	-	-	-	-	-	-	-	-	-
CO.5	3	2	2	-	-	-	-	-	-	-	-	-
CO	3	2	2	-	-	-	-	-	-	-	-	-

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IV Year B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE423A ADVANCED COMPUTER ARCHITECTURE (Core Elective - IV)

Course Educational Objectives:
CEO1: To understand the basics of fundamental computer units.
CEO2: To gain the knowledge on parallel computers and instruction level parallelism.
CEO3: To acquire knowledge memory concepts, functional principles and design of memory hierarchy.
CEO4: To obtain the concepts of multiprocessors.
CEO5: To be able to define the advanced processors and functionality.

UNIT 1: FUNDAMENTALS OF COMPUTER DESIGN
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
The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector 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
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
Introduction, Characteristics of Application Domains, Centralized Shared Memory Architectures, Distributed Shared Memory Architectures, Synchronization, Models of Memory Consistency, Crosscutting Issues.

UNIT 5: ADVANCED PROCESSORS
Advanced processor technology, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Able to know the functional units, classification and difference between uni-bus and multi-bus systems.	PO1, PO2
CO2	Demonstrate and the classification of parallel computers. Analyze the complex issues related to data hazard and branch penalties.	PO1, PO2, PO4
CO3	Classification of memory. Identify cache and memory related issues in multi-processors and design of memory hierarchy.	PO1, PO2, PO3
CO4	Demonstrate the multiprocessors architecture and its classifications.	PO1, PO2
CO5	Acquire knowledge on advanced processors and difference between RISC and CISC.	PO1, PO2

TECT BOOKS:

1. Kai Hwang, "Advanced computer architecture", Tata-Mc. Graw Hill Publishers, 2000.
2. D. A. Patterson and J. L. Hennessey, "Computer organization and design," Morgan Kaufmann, 2nd Ed., 1998.
3. J.P.Hayes, "computer Architecture and organization", Mc-Graw Hill, 1998.

REFERENCE BOOKS:

1. Harvey G.Cragon,"Memory System and Pipelined processors"; Narosa Publication, 1998.
2. R.K.Ghose, Rajan Moona & Phalguni Gupta, "Foundation of Parallel Processing"; Narosa Publications, 2003.

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	2	3	2	-	-	-	-	-	-	-	--	-
CO4	3	2	-	-	-	-	-	-	-	-	--	-
CO5	3	2	-	-	-	-	-	-	-	-	--	-
CO*	3	2.2	2	2	-	-	-	-	-	-	--	-

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IV B.TECH II SEMESTER	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE423B PATTERN RECOGNITION (Core Elective - IV)

Course Educational Objectives:
CEO1: To provide knowledge on Basics Pattern Recognition.
CEO2: To acquire knowledge on various methods of statistical Pattern Recognition.
CEO3: To be able to solve dimensionality problem.
CEO4: To understand the linear discriminant functions and neural network classifier.
CEO5: To gain the principle of time varying pattern recognition and unsupervised classification.

UNIT - 1:

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

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

Dimension and accuracy, Computational Complexity, Dimensionality Reduction, Fisher Density Estimation, Nearest Neighbor Rule, Fuzzy Classification.

UNIT - 4:

Linear Discriminant Functions: 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: First Order Hidden Markov Model, Evaluation, Decoding, Learning.

Unsupervised Classification: Clustering, Hierarchical Clustering, Graph Based Method, Sum of Squared Error Technique Iterative Optimization.

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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
CO3	Ability to understand the dimensionality problem.	PO1, PO2
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

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.

REFERENCE BOOKS:

a. Duda R.O., and Har P.E., Pattern Classification and Scene Analysis, Wiley, New York, 1973.
b. 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	2	-	-	-	-	-	-	--	-	-	-
CO2	3	2	-	-	-	-	-	-	--	-	-	-
CO3	3	2	-	-	-	-	-	-	--	-	-	-
CO4	3	2	-	-	-	-	-	-	--	-	-	-
CO5	3	2	-	-	-	-	-	-	--	-	-	-
CO*	3	2	-	-	-	-	-	-	--	-	-	-

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IV Year B.Tech II semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE424C RF INTEGRATED CIRCUITS (Core Elective - IV)

Course Educational Objectives:

CEO1: To provide knowledge on RF system architecture, transmission lines, RLC networks and IC interconnects.
CEO2: To understand and analyze the transmission lines using Smith charts, designing HF amplifiers, estimating Bandwidth, and understanding shunt-series, tuned and cascade amplifiers.
CEO3: To analyze the various noise sources in the ICs, to design Low Noise Amplifier and understanding with design examples, to design mixers.
CEO4: To design Class A, AB, B, C, D, E, F power amplifiers, Voltage Controlled Oscillators, Resonators, PLL.
CEO5: To understand Frequency division, integer N and Fractional synthesis, and GSM, CDMA, UMTS radio architectures.

UNIT – I Introduction RF systems:

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:

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:

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, Subsampling mixers.

UNIT – IV RF Power Amplifiers:

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 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

Course Outcomes:

On successful completion of the course the student will be able to		**PO MAPPING**
CO.1	Demonstrate RF system architecture, transmission lines, RLC networks and IC interconnects, and apply Pi and T matching techniques for impedance matching of the transmission line to load	PO1, PO2, PO3
CO.2	Analyze the reflection coefficient of transmission lines using Smith charts, design HF amplifiers, apply short-circuit and open-circuit time constants methods to estimate Bandwidth and demonstrate shunt-series, tuned and cascade amplifiers.	PO1, PO2, PO3, PO4
CO.3	Demonstrate Thermal and Flickering Noises in the RFICs, design Low Noise Amplifier and mixers.	PO1, PO3
CO.4	Demonstrate Class A, AB, B, C, D, E, F power amplifiers; and design RF Amplifier, Voltage Controlled Oscillators, Resonators, PLL.	PO1, PO2
CO.5	Demonstrate the concepts of Frequency division, integer N and Fractional synthesis and compare the developments from GSM, CDMA, to UMTS radio architectures.	PO1

Textbooks:

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	-	-	-	-	-	-	-	-	--	-
CO2	3	2	2	2	-	-	-	-	-	-	--	-
CO3	3	-	2	-	-	-	-	-	-	-	--	-
CO4	3	2	-	-	-	-	-	-	-	-	--	-
CO5	3	-	-	-	-	-	-	-	-	-	--	-
CO*	3	2	2	2	-	-	-	-	-	-	--	-

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IV Year B.Tech I semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE423D CYBER SECURITY (Core Elective - IV)

Course Educational Objectives:
CE01: To understand the OSI architecture by different services and mechanisms
CE02: To Provide the student to learn various block cipher and stream cipher using different algorithms.
CE03: Analyze the depth learning of finite fields and number theory also learn the cryptography
CE04: Describe the principles of public key cryptosytems, hash functions and digital signature.
CE05: To Secure the network and studying about the layers by different concepts

UNIT - 1: Basic Principles
Introduction to Cryptography, types and techniques, Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT - 2: Symmetric Encryption
Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard. RSA algorithm.

UNIT - 3: Asymmetric Encryption
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
Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT - 5: Network Security
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 .

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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
C02	Different types of symmetric advanced standards and algorithms are learned	P01, P02
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,P04
C05	Different types of Security coding and applications are learned	P01, P02

TEXT BOOK:

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	2	-	-	-	-	-	-	-	-	--	-
CO2	3	2	-	-	-	-	-	-	-	-	--	-
CO3	3	2	2	2	-	-	-	-	-	-	--	-
CO4	3	2	-	2	-	-	-	-	-	-	--	-
CO5	3	2	-	-	-	-	-	-	-	-	--	-
CO*	3	2	2	2	-	-	-	-	-	-	--	-

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IV B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE424A EMBEDDED REAL TIME OPERATING SYSTEMS (Core Elective - V)

Course Educational Objectives:

CE01: To understand the basics of an embedded system with developed applications
CE02: To design a different types of devices using advanced techniques
CE03: Students will learn different types of programming models and knowledge in Embedded C.
CE04: To understand operating systems concepts, types and choosing RTOS.
CE05: To design and implement and test an embedded system.

UNIT - 1: INTRODUCTION

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

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, Realtimeclock.

UNIT - 3: EMBEDDED FIRMWARE DESIGN

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):

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

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).

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	2	-	-	-	-	-	-	-	-	--	-
CO2	3	2	2	-	-	-	-	-	-	-	--	-
CO3	3	2	2	-	-	-	-	-	-	-	--	-
CO4	3	2	-	2	-	-	-	-	-	-	--	-
CO5	3	2	-	-	-	-	-	-	-	-	--	-
CO*	3	2	2	2	-	-	-	-	-	-	--	-

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IV Year B-Tech II semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE424B ARTIFICIAL NEURAL NETWORK(Core Elective - V)

Course Educational Objectives:

CEO1: To provide in depth knowledge on the latest subject and their applications in different fields.
CEO2: To introduce the various learning rules of Neural Networks both supervised and unsupervised.
CEO3: To explain the working of error back propagation training algorithm and its use as a mathematical tool for solving problems.
CEO4: To understand the biological neural network and to model equivalent neuron models
CEO5: To apply Neural networks to practical problems and to find solutions

UNIT 1:

Introduction : AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT 2:

Searching : Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Greedy best first search, A* search Game Playing: Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search.

UNIT 3:

Knowledge Representation & Reasons logical Agents, Knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in propos ional logic, Resolution, Forward & Backward. Chaining.

UNIT 4:

Characteristics of Neural Networks, Historical Development of Neural Networks Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws, Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units.

UNIT 5:

Feed forward Neural Networks: Introduction, Analysis of pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of pattern storage Networks. Analysis of Pattern Mapping Networks. Feedback Neural Networks Introduction, Analysis of Linear Autoassociative FF Networks, Analysis of Pattern Storage Networks.

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,PO3
CO4	Understand the difference in network architecture and an ability to design networks.	PO1,PO2
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

Reference Books:

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	3	2	-	2	-	-	-	-	-	-	--	-
CO3	3	3	2	-	-	-	-	-	-	-	--	-
CO4	3	2	-	-	-	-	-	-	-	-	--	-
CO5	3	2	-	-	-	-	-	-	-	-	--	-
CO*	3	2.2	2	2	-	-	-	-	-	-	--	-

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IV B.Tech II SEM		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
16ECE424C	**BIO-MEDICAL INSTRUMENTATION**	**(Core Elective -V)**			

Course Educational Objectives:

CEO:1 To provide an overview of medical instrumentation system, Bio-amplifier and characteristics of medical instruments.

CEO:2 To Describe the Cell structure**,** Bio-Potential and Bio-Chemical electrodes.

CEO:3 To analyze different time base generators used in cardiac instrumentation.

CEO:4 To know the functions of ECG,EEG and EMG machines.

CEO:5 To understand and analyze Pacemaker, Defibrillator etc in Respiratory Instrumentation and Advanced 3D surgical techniques.

UNIT - 1: COMPONENTS OF MEDICAL INSTRUMENTATION SYSTEM

Block diagram of medical instrumentation system,Boi-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

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

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

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

Heart-Lung Machine, Pacemaker, Defibrillator ,Shortwave diathermy, Hemadialysis machine, Mechanism of respiration,Spirometry,Pneumatotachograph,Ventillators- Nano Robots -Robotic surgery – Advanced 3D surgical techniques

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,PO4
CO3	Analyze the various parts in time base generators used in cardiac instrumentation.	PO1,PO2,PO3
CO4	Know the functions of ECG, EEG and EMG machines.	PO1,PO2,PO4
CO5	Understand and analyze Pacemaker, Defibrillator etc in Respiratory Instrumentation and Advanced 3D surgical techniques.	PO1,PO2

TEXT BOOKS :

3. Bio Medical Instrumentation and Measurements – 2nd Edition ,2002, Leslie Cromwell, Fred J.Weibell Erich A.Pfeiffer , Pearson Education , New Delhi
4. Handbook of Bio Medical instrumentation - 3rd edition ,2003,R.S.Khandpur,Tata McGraw Hill Publishing Co Ltd , New Delhi.

.

REFERENCES BOOKS:

3. Medical Instrumentation -1st edition ,1995 ,J.Webster ,John Wiley & Sons, London
4. 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	2	-	-	-	-	-	-	-	-	--	-
CO2	3	2	-	2	-	-	-	-	-	-	--	-
CO3	3	3	2	-	-	-	-	-	-	-	--	-
CO4	3	2	-	2	-	-	-	-	-	-	--	-
CO5	3	2	-	-	-	-	-	-	-	-	--	-
CO*	3	2.2	2	2	-	-	-	-	-	-	--	-

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IV B.Tech II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16ECE424D ADVANCED MICROCONTROLLERS (Core Elective - V)

OBJECTIVES:

CEO1: To provide knowledge on

- Fundamentals of RISC processor
- Basic Arithmetic, logical operations.
- Interrupt programming

CEO2: To become skilled in 16 bit Microcontroller Architecture.
CEO3: To develop skill to understand MSP430 16 bit controller
CEO4: To understand and learn Programming and Interfacing using MSP430.
CEO5: To develop skill to learn Communication interface using MSP430 microcontroller.

UNIT - 1: RISC PROCESSORS

RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM, RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.

UNIT - 2: CISC PROCESSORS

RL78 16 BIT Microcontroller architecture, addressing modes, on-Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self programming.

UNIT - 3: MSP430 16 - BIT MICROCONTROLLER

The MSP430 Architecture, CPU Registers, Instruction Set, addressing modes, the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430 : low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.

UNIT - 4: PROGRAMMING AND PERIPHERAL INTERFACE USING MSP430 FAMILIES

Memory mapped peripherals, I/O pin multiplexing, Timers, RTC, watchdog timer, PWM control, Analog interfacing and data acquisition, DMA, programming with above internal peripherals using optimal power consumption. Case study: Remote control of air conditioner and home appliances.

UNIT -5: COMMUNICATION INTERFACE USING MSP 430 MICROCONTROLLER

Serial and parallel communication, synchronous and asynchronous interfaces , Implementing and programming of : UART, I2C and SPI protocol. wireless connectivity : NFC, Zigbee, bluetooth and WiFi. MSP430 development tools. Case study: Implementing WiFi connectivity in smart electric meter.

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Course Outcomes:

On successful completion of the course the student will be able to		**POs related to COs**
CO1	Able to understand the RISC Processors, ADC and DAC interfacing.	PO1, PO2 ,PO3
CO2	Acquire the knowledge on CISC processor, onchip debug and programming.	PO1, PO2, PO3
CO3	Able to understand MSP430 architecture and Registers.	PO1, PO2
CO4	Gain the knowledge on Programming and interfacing using MSP 430	PO1, PO2,PO4
CO5	Acquire the knowledge on Communication interface using MSP 430 Controllers.	PO1, PO2

TEXT BOOK:

1. Creating fast, Responsive and energy efficient Embedded systems using the Renesas RL78 microcontroller, Alaxander G, James M. Conard, micrium press, USA, reprinted by S.P Printers, Haryana ISBN No.978-1-935772-98-9, 2011.

REFERENCES:

1. PIC Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey, Pearson Education, 2008.
2. MSP 430 Micro controller basics, John H. Davies, Elsevier, 2008.

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	2	-	-	-	-	-	-	-	-	--	-
CO*	3	2	2	2	-	-	-	-	-	-	--	-

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IV Year B. TECH II Semester	**L**	**T**	**P**	**C**
	18	**0**	**0**	**10**

16ECE425 PROJECT WORK

Course Educational Objectives:

CEO1: To develop the ability to undertake problem identification, formulation and solution.
CEO2: To demonstrate the ability to engage in design and to execute to an appropriate professional standard.
CEO3: To develop the capacity to undertake lifelong learning.
CEO4: To develop the ability to communicate effectively, not only with engineers but also with the community at large.
CEO5: 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.

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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**