AR- 13

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

For

B.TECH. FOUR YEAR DEGREE PROGRAMME
(Applicable for the batches admitted from 2013-2014)

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT (AUTONOMOUS)
Approved by AICTE
Recognised under 2(f),12(b) of UGC
Permanently Affiliated to JNTUK, Kakinada
K.Kotturu, Tekkali, Srikakulam-532 201, Andhra Pradesh.

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that efficiency or employability increases on a continued basis.

VISION OF THE DEPARTMENT

Create high-quality engineering professionals through research, innovation and teamwork for a lasting technology development in the area of Electronics and Communication Engineering.

MISSION OF THE DEPARTMENT

M1. To offer a well-balanced Program of instruction, lab practices, research & development activities, product incubation.

M2. Develop accomplished technical personnel with a strong background on fundamental and advanced concepts, have excellent professional conduct.

M3. Enhance overall personality development which includes innovative and group work exercises, entrepreneur skills, communication skills and employability

M4. Ensuring effective teaching learning process to provide in-depth knowledge of principles and its applications pertaining to Electronics & Communication Engineering and interdisciplinary areas.

M5. Providing industry and department interactions through consultancy and sponsored research.

PROGRAM EDUCATIONAL OBJECTIVES

On successful completion of under graduation in Electronics and Communication Engineering, the graduates are expected to attain the following program educational objectives.

PEO I. The graduates will be employed as a practicing engineer in fields such as design, testing and manufacturing.

PEO II. The graduates will be able to imbibe research, development and entrepreneurship skills.

PEO III. The graduates will be engaged in lifelong self-directed learning to maintain and enhance professional skills.

PEO IV. The graduates will be able to exhibit communication skills, team spirit, leadership skills and ethics with social responsibility.

PROGRAM OUTCOMES

a) Apply the knowledge of mathematics, science, engineering fundamentals to solve complex electronics and communication engineering problems.

b) Apply research based knowledge to design and conduct experiments, analyze, synthesize and interpret the data pertaining to Electronics and Communication Engineering problems and arrive at valid conclusions.

c) Design solutions for electronics and communication engineering problems and design system components and processes that meet the specified needs with appropriate consideration for public health and safety.

d) Function effectively either as a member or a leader in a multi disciplinary activities.

e) Identify, formulate and analyze problems related to electronics and communication engineering and substantiate the conclusions using the first principles of sciences and engineering.

f) Develop consciousness of professional, ethical and social responsibilities as experts in the field of Electronics and Communication Engineering.

g) Communicate the engineering activities to engineering society for documentation and presentation.

h) The broad education including management & finance necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context

i) Realize the need for lifelong learning and engage them to adopt technological changes in their specialized areas of electronics and communication engineering.

j) Continuously update their knowledge on contemporary issues.

k) Construct, choose and apply the techniques, resources and modern engineering tools required for Electronics and Communication Engineering applications.

l) Qualify in competitive examinations like GATE, IES etc.

ACADEMIC REGULATIONS 2013

(Effective for the students admitted into I year from the Academic Year 2013-2014 and onwards)

1. Award of B. Tech. Degree:

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

(a) Pursued a course of study for not less than four academic years and not more than eight academic years.

(b) Registered for **180** credits and he/she must secure total **180** credits.

2. Students, who fail to complete their Four years Course of study within **8** years or fail to acquire the 180 Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

3. Courses of study:

The following courses of study are offered at present with specialization in the B.Tech. Program.

S. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology

And any other course as approved by the authorities of the University from time to time.

4. Credits (Semester system from I year onwards):

Sl. No	Course	Credits
1	Theory Course	02/03
2	Laboratory Course	02
3	Advanced Laboratory Course	03
3	Self Study course/Internship	01
4	Employability skills	02
5	Project	06

5. Evaluation Methodology:

The performance of a student in each semester shall be evaluated subject – wise with a maximum of **100** marks for theory course and **75** marks for laboratory and other courses. The project work shall be evaluated for **200** marks.

5.1 Theory course:

For theory courses the distribution shall be **30** marks for Internal Evaluation and **70** marks for the End - Examinations.

Out of 30 internal marks – **25** marks are assigned for descriptive exam and 5 marks for assignments.

(i) Pattern for Internal Midterm Examinations (25 marks):

For theory courses of each semester there shall be **3** Midterm descriptive/objective exams. Each descriptive/objective exam consists of **120** minutes duration for **25** marks. The average of the best two out of three mid exams will be taken for the assessment of internal marks.

The first Midterm examination to be conducted usually after **5** weeks of instruction, the second Midterm examination to be conducted usually after **11** weeks of instruction and the third Midterm examination will be conducted usually after **17** weeks of instruction. Each Midterm question paper shall contain **4** questions, out of 4 questions first question is objective type which contains 10 questions with 1 mark each (10 x 1 =10M) and remaining 3 questions are descriptive type (3 x 10= 30M). The student should answer all **4** questions.

(ii) Pattern for External End Examinations (70 marks):

(a) There shall be an external examination for every theory course and consists of two parts (part-A and part-B). The duration of the time for this end examination is 3 hours.

(b) Part-A shall contain 10 marks, which is compulsory. It has 10 short questions with 1 mark each (10x1=10M). Two questions will be given from each unit.

(c) Part-B of the question paper shall have descriptive type questions for 60 marks. There shall be two questions from each unit with internal choice. Each question carries 12 marks. Each course shall consist of 5 units of syllabus.

5.2 Laboratory Course:

(i) **(a)** For practical subjects there shall be continuous evaluation during the semester for **25** internal marks and **50** semester end examination marks. Out of the **25** marks for internal: **10** marks for day to day work, **5** for record and **10** marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

(b) For the benefit of the students, two advanced labs are introduced with some specialized areas in each B.Tech. Program.

(ii.)For the course having design and / or drawing, (such as Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal

evaluation (15 marks for day – to – day work, and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests.

5.3 Project Work:

Out of a total of 200 marks for the project work, **60** marks shall be for Project Internal Evaluation and **140** marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee.

5.4 Self Study course:

Four Periods per week (which includes library, e-learning, Internet and presentation) are allotted for this course. Self Study shall be evaluated for 75 Marks.

Out of **75** Marks, **25** marks for day-to-day evaluation and **50** marks on the basis of end examination conducted by internal committee consisting of Head of the Department, Two Senior faculty Members of the department concerned. There shall be no external examination for self-study.

5.5 Audit Course:

Audit course is one among the compulsory courses and does not carry any credits. The audit courses will start from the II year I- semester onwards. The lists of audit courses are shown below:

i) Professional Ethics and Morals
ii) IPR & Patents

5.6 Employability Skills:

Employability skills shall be evaluated for **75** marks. **25** marks for day-to-day evaluation and **50** marks on the basis of end (internal) examination. There is no external examination for employability skills.

5.7 Internship:

All the students shall undergo the internship period of **4** weeks and the students have an option of choosing their own industry which may be related to their respective branch. A self study report for the internship shall be submitted and evaluated during the IV year II-Semester and will be evaluated for a total of **75** marks consists of **25** marks for internal assessment and **50** marks for end examination.

Internal assessment for **25** marks shall be done by the internship supervisor. Semester end examination for **50** marks shall be conducted by committee consists of Head of the Department, internal supervisor and an external examiner.

6. Attendance Requirements:

i. A student shall be eligible to appear for End Semester examinations, if he/she acquires a minimum of **75%** of attendance in aggregate of all the subjects.

ii. Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below 75%) in each semester with genuine reasons and shall be approved by a committee duly appointed by the college. The condonation approved otherwise it can be reviewed by the College academic committee.

iii. A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.

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

v. 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.

vi. A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

7. Minimum Academic Requirements:

7.1 Conditions for pass and award of credits for a course:

a) A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks (Internal & Semester end examination marks put together), subject to a minimum of 35% marks in semester end examination.

b) On passing a course of a programme, the student shall earn assigned credits in that Course.

7.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Grade Points	Letter Grade
90-100%	10	S
80-89%	9	A
70-79%	8	B
60-69%	7	C
50-59%	6	D
40-49%	5	E
< 40%	0	F (Fail)

7.3 Calculation of Semester Grade Points Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(for all courses passed in semester)}$$

Where CR = Credits of a Course

GP = Grade points awarded for a course

*SGPA is calculated for the candidates who passed all the courses in that semester.

7.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(For entire programme)}$$

Where CR = Credits of a course

GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	DIVISION
≥ 7.75	First Class with distinction
≥ 6.75 and < 7.75	First Class
≥ 5.75 and < 6.75	Second Class
≥ 5.00 and < 5.75	Pass Class
< 5	Fail

7.5 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

7.6 Conditions for Promotion:

i. A student will be promoted to second year, if he/she put up the minimum attendance requirement.

ii. A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if number credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.

iii. A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

iv. A student shall register and put up minimum attendance in all **180** credits and earn all **180** credits, marks obtained in **180** credits shall be considered for the calculation of percentage of marks.

8. Course pattern:

(i) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(ii) A student is eligible to appear for the end examination in a subject, but absent for it or failed in the end examinations may appear for that subject's supplementary examinations, when offered.

(iii) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold good with the regulations he/she first admitted.

9. **Minimum Instruction Days:**

The minimum instruction days for each semester shall be **95** clear instruction days.

10. **There shall be no branch transfer after the completion of admission process**.

11. **General:**

(i) Where the words "he" "him" "his", occur in the regulations, they include "she", "her", "hers".

(ii) The academic regulation should be read as a whole for the purpose of any interpretation.

(iii) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

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

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ACADEMIC REGULATIONS 2014 FOR B. TECH. (LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year from the Academic Year 2014-2015 and onwards)

1. Award of B. Tech. Degree:

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

a) Pursued a course of study for not less than three academic years and not more than six academic years.
b) Registered for **131** credits and must secure **131** credits.

2. Students, who fail to complete their three year Course of study within six years or fail to acquire the **131** Credits for the award of the degree within **6** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

3. Promotion Rule:

(a) A lateral entry student will be promoted to II year to III year if he puts up the minimum required attendance in II year.

(b) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations , whether the candidate takes the examinations or not.

4. Minimum Academic Requirements:

4.1 Conditions for pass and award of credits for a course:

a) A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks (Internal & Semester end examination marks put together), subject to a minimum of 35% marks in semester end examination.
b) On passing a course of a programme, the student shall earn assigned credits in that Course.

4.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Grade Points	Letter Grade
90-100%	10	S
80-89%	9	A
70-79%	8	B
60-69%	7	C
50-59%	6	D
40-49%	5	E
< 40%	0	F (Fail)

4.3 Calculation of Semester Grade Points Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(for all courses passed in semester)}$$

Where CR = Credits of a Course
GP = Grade points awarded for a course

*SGPA is calculated for the candidates who passed all the courses in that semester.

4.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(for entire programme)}$$

Where CR = Credits of a course
GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	DIVISION
≥ 7.75	First Class with distinction
≥ 6.75 and < 7.75	First Class
≥ 5.75 and < 6.75	Second Class
≥ 5.00 and < 5.75	Pass Class
< 5	Fail

5. All other regulations as applicable for B. Tech. Four- year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the student possesses or keeps accessible 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 or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student 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)	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or students in 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 students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student 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 student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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.

3	If the student impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the student smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination 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 student 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 student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.

5	If the student 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	If the student 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 of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result 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.	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 students also are 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.

7	If the student 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 student 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 student 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.
8	If the student 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 student 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 student is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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	If the student comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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 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 student has appeared including practical examinations and project work of that semester/year examinations.

COURSE STRUCTURE (AR13)

I - B.Tech **I – SEMESTER**

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
1	13HS1001	English – I	3	1	-	3	30	70
2	13HS1003	Environmental Studies	3	1	-	3	30	70
3	13BS1001	Engineering Mathematics – I	3	1	-	3	30	70
4	13BS1005	Engineering Chemistry	3	1	-	3	30	70
5	13EC1001	Electronic Devices	3	1	-	3	30	70
6	13ME1003	Engineering Mechanics	3	1	-	3	30	70
7	13BS1102	Engineering Chemistry Lab	-	-	3	2	25	50
8	13EC1101	Electronic workshop	-	-	3	2	25	50
9	13CS1103	IT Workshop	-	-	3	2	25	50
TOTAL PERIODS/TOTAL CREDITS			**33**			**24**	**825**	

I - B.Tech **II – SEMESTER**

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
1	13HS1002	English – II	2	1	-	2	30	70
2	13CS1001	Computer Programming	3	1	-	3	30	70
3	13BS1002	Engineering Mathematics – II	3	1	-	3	30	70
4	13BS1003	Engineering Mathematics – III	3	1	-	3	30	70
5	13BS1004	Engineering Physics	3	1	-	3	30	70
6	13ME1001	Engineering Drawing	1	-	3	3	30	70
7	13HS1101	Basic English Language Communication Skills Lab	-	-	3	2	25	50
8	13BS1101	Engineering Physics Lab	-	-	3	2	25	50
9	13CS1101	Computer Programming Lab	-	-	3	2	25	50
10	13ME1101	Engineering Workshop	-	-	3	2	25	50
TOTAL PERIODS/TOTAL CREDITS			**35**			**25**	**900**	

II - B.Tech **I – SEMESTER**

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
1	13EC2002	Electronic Circuits – 1	3	1	-	3	30	70
2	13EC2003	Switching Theory & Logic Design	3	1	-	3	30	70
3	13EC2004	Signals & Systems	3	1	-	3	30	70
4	13EC2005	Probability Theory & Stochastic Processes	3	1	-	3	30	70
5	13EE2007	Network Analysis	3	1	-	3	30	70
6	13EE2008	Electrical Technology	3	1	-	3	30	70
7	13EC2102	Electronic Devices and Circuits Lab	-	-	3	2	25	50
8	13EE2107	Networks and Electrical Technology Lab	-	-	3	2	25	50
9	13HS2102	Advanced English Language Communication Skills Lab	-	-	3	2	25	50
10	13HS2201	Professional Ethics & Morals	2	-	-	-	-	-
TOTAL PERIODS/TOTAL CREDITS			**35**			**24**	**825**	

II - B.Tech **II – SEMESTER**

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
1	13EC2008	Electronic Circuits – 2	3	1	-	3	30	70
2	13EC2009	Analog Communications	3	1	-	3	30	70
3	13EC2010	Pulse & Digital Circuits	3	1	-	3	30	70
4	13EC2011	Electromagnetic Waves and Transmission Lines	3	1	-	3	30	70
5	13EE2013	Linear Control Systems	3	1	-	3	30	70
6	13EC2103	Pulse & Digital Circuits Lab	-	-	3	2	25	50
7	13EC2105	Analog communications Lab	-	-	3	2	25	50
8	13EC2106	Electronic Circuits Analysis Lab	-	-	3	2	25	50
9	13EC2201	Self Study Course – I*	-	-	-	1	75	-
TOTAL PERIODS/TOTAL CREDITS			**29**			**22**	**800**	

***4 Periods Which Include Library, e- Learning, Internet and Presentation**

III - B.Tech **I – SEMESTER**

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
1	13EC3012	Linear IC Applications	3	1	-	3	30	70
2	13EC3013	Digital IC Applications	3	1	-	3	30	70
3	13EC3014	Digital communications	3	1	-	3	30	70
4	13EC3015	Antennas and Wave Propagation	3	1	-	3	30	70
5	13EC3047	Electronic Measurements and Instrumentation	3	1	-	3	30	70
6	13CS3008	Computer Organization & Architecture	3	1	-	3	30	70
7	13EC3107	Digital Communications lab	-	-	3	2	25	50
8	13EC3108	IC Applications Lab	-	-	3	2	25	50
9	13HS3202	I P R & Patents	2	-	-	-	-	-
TOTAL PERIODS/TOTAL CREDITS			**32**			**22**	**750**	

III - B. Tech **II – SEMESTER**

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
1	13HS3005	Managerial Economics& Management Science	3	-	-	2	30	70
2	13EC3019	Microprocessors and Microcontrollers	3	1	-	3	30	70
3	13EC3020	Digital Signal Processing	3	1	-	3	30	70
4	13EC3021	VLSI Design	3	1	-	3	30	70
05	**Elective – I**		3	1	-	3	30	70
	13EC3022	TV & Satellite Communications						
	13EC3023	Bio-medical Signal processing						
	13EC3024	Analog IC design						
	13EC3025	Transform Techniques						
	13EC3026	OOPS through Java						
6	13EC3109	Microprocessor and Microcontroller Lab	-	-	3	2	25	50

7	13EC3110	Digital Signal Processing Lab	-	-	3	2	25	50
8	13EC3111	HDL Programming Lab	-	-	4	3	25	50
9	13EC3202	Self Study Course – 2*	-	-	-	1	75	-
TOTAL PERIODS/TOTAL CREDITS			**29**			**22**	**800**	

***4 Periods which include Library, e- Learning, Internet and Presentation**

IV- B.Tech I – SEMESTER

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
1	13EC4027	Digital Image Processing	3	1	-	3	30	70
2	13EC4028	Radar Engineering	3	1	-	3	30	70
3	13EC4029	Microwave Engineering	3	1	-	3	30	70
4	13EC4030	Telecommunication Switching Systems and Networks	3	1	-	3	30	70
05	**Elective – II**		3	1	-	3	30	70
	13EC4031	Wireless Communication Networks						
	13EC4032	Speech Processing						
	13EC4033	Digital IC Design						
	13EC4034	Artificial Neural Networks						
	13EC4035	Data Base Management systems						
06	**Open Elective**		3	1	-	3	30	70
	13OE4001	Air Quality Management						
	13OE4002	Cyber Laws						
	13OE4003	Entrepreneurial Development						
	13OE4004	Industrial Safety and Environment						
	13OE4005	Micro Electro Mechanical Systems						
	13OE4006	Optimization Techniques						
	13OE4007	Renewable Energy						
	13OE4008	Advanced Materials						
	13OE4009	Total Quality Management						
07	13EC4112	Microwave Engineering Lab	-	-	3	2	25	50
08	13EC4113	VLSI Lab	-	-	4	3	25	50
09	13HS4203	Employability skills			3	2	75	-
TOTAL PERIODS/TOTAL CREDITS			**34**			**25**	**825**	

IV - B.Tech **II - SEMESTER**

S. No	Sub. Code	Subject	L	T	P	C	INT	EXT
01	13EC4036	Cellular and Mobile Communications	3	1	-	3	30	70
02	**Elective – III**		3	1	-	3	30	70
	13EC4037	Optical Communications & Networks						
	13EC4038	Advanced signal processing						
	13EC4039	Advanced Computer Architecture						
	13EC4040	Mixed signal IC design						
	13EC4041	Operating Systems						
03	**Elective – IV**		3	1	-	3	30	70
	13EC4042	Global Positioning System and its applications						
	13EC4043	Data Warehousing & Data Mining						
	13EC4044	Embedded & real time operating systems						
	13EC4045	Soft computing techniques						
	13EC4046	Network security & Cryptography						
04	13EE4203	Internship	-	-	-	1	25	50
05	13EE4204	Project Work	6	-	-	6	60	140
TOTAL PERIODS/TOTAL CREDITS			**18**			**16**	**575**	

L - LECTURE HOURS/WEEK

T- TUTORIAL HOURS/WEEK

P-PRACTICAL HOURS/WEEK

C- CREDITS

INT-INTERNAL MARKS

EXT- EXTERNAL MARKS

ENGLISH - I
(Common for all Branches)

Subject Code: 13HS1001 **Internal Marks: 30**
Credits: 03 **External Marks: 70**

Objectives

- To improve the language proficiency of a technical under-graduate in English with emphasis on LSRW skills.
- To provide learning environment to practice listening, speaking, reading and writing skills.
- To effectively integrate English language learning with employability skills and training.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.
- To expose the students to a variety of self-instructional modes of language learning.

Outcomes

At the end of the course students will be able to

CO1: **use** English language in their day-to-day life.
CO2: **employ** LSRW skills within and beyond the classroom environment.
CO3: **integrate** English Language Learning with employability skills.
CO4: **demonstrate** better with more observation and practice.
CO5: **relate** classroom language learning to the real life situations, **interpret** things and draw **inferences** accordingly.

Syllabus

Unit-I: *Lost Forests* by Johannes V Jensen
Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-II: *More Than 100 Million Women Missing* by Amartya Sen
Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-III: *Three Days to See* by Helen Keller
Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-IV: *Reaching the Stars* by Kalpana Chawla
Reading –Vocabulary-Essential Grammar-Writing-Classroom activities
Unit-V: *Kalahandi* by Jagannath Prasad Das
Reading –Vocabulary-Essential Grammar-Writing-Classroom activities

References:

1. "Musings on Vital Issues". Ed. P.J. George Pub: Orient Blackswan
2. *My Story* by Helen Keller
3. *Kalpana Chawla: A Life* by Padmanabham, Anil
4. Word *Power Made Easy* by Norman Lewis

ENVIRONMENTAL STUDIES
(Common to all branches)

Subject Code: 13HS1003 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:-

- Memorize the overall knowledge of the environment; differentiate the resources, reserves, importance and conservation.
- Identify the significance, arrangement, causes of annihilation of ecosystems and biodiversity; recognize the importance of their protection and preservation.
- Discriminate various causes, effects of a range of environmental pollutions and describe the appropriate control methods.
- Identify the sustainable development; evaluate the different environmental management issues and environmental legal issues.
- Describe the variations in population growth, recognizes the human health problems and evaluate the environmental assets.

Outcomes:-

CO1: Recognize the general issues of environment and know how to conserve the environment, speaks well again on various resources, present status and their better usage.

CO2: Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.

CO3: Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their ecofriendly disposal methods.

CO4: Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.

CO5: Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.

UNIT – I **(14 Lecture hours)**

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness. Environmental components – Atmosphere – Hydrosphere – Lithosphere – Biosphere

Natural Resources: Resources classification – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems on Tribal population & Environment - Mineral resources: Use and exploitation, Tribal & environmental effects of extracting and using

mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity – concept of sustainable agricultural methods, case studies. – Energy resources: Growing energy needs, non-renewable energy sources - coal, crude oil, natural gas - use of renewable and alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.

UNIT – II **(12 Lecture hours)**

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. Food chains, food webs and ecological pyramids - Energy flow and nutrient flow in the ecosystems - Ecological succession - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem

d. Aquatic ecosystems (lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Case studies.

UNIT – III **(12 Lecture hours)**

Environmental Pollution: Definition, Causes, effects and control measures of:

a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution

e. Noise pollution f. Thermal pollution g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban, Industrial and bio-medical wastes. - Pollution case studies. Role of individual in prevention of pollution - **Disaster management:** floods, earthquake, cyclone and landslides.

UNIT – IV **(10 Lecture hours)**

Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Urbanization and Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies -World summits on environment -Wasteland reclamation -EIA methodologies – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation.

UNIT – V **(6 Lecture hours)**

Human Population and the Environment: Population growth, variation among nations. Population problems and control –Environment and human health. Role of information Technology in Environment and human health – Case Studies.

Field work: Visit to a local area to document environmental assets River/forest/ grassland/hill/mountain -Visit to a local polluted site Urban/Rural/industrial/ Agricultural - Study of common plants, insects, birds. -Study of simple ecosystems pond, river, hill slopes, etc.

Text Books:

1. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt., Ltd., Hyderabad.
2. Dr. S. Keerthinarayana & Dr. C. Daniel Yesudian. 2004, *Principles of Environmental Science and Engineering*, First edition, Anuradha Publications (P) Ltd., Kumbakonam.
3. P. Anandan & R. Kumaravelan. 2010, *Environmental Science & Engineering*, Sixth reprint, Scitech Publications (India) (P) Ltd., Chennai.
4. Anubha Kaushik & C. P. Kaushik. 2011, *Environmental Studies*, Third edition, New Age International (P) Ltd., New Delhi.
5. Dr. Surinder Deswal & Dr. Anupama Deswal. 2008-09, *A Basic Course in Environmental Studies*, Second revised edition, Dhanpat Rai & Co (P) Ltd., New Delhi.

ENGINEERING MATHEMATICS-I

(Common to All Branches)

Subject Code: 13BS1001 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Solve the 1st order differential equations choosing suitable method and apply to estimate population, temperature, quantity and trajectory
- Solve a 2nd and higher order differential equations with constant coefficients, choosing suitable rule & apply to LCR Circuits and Simple Harmonic equations.
- Write Taylor series and Mc Laurent's series for two variable functions and calculate extreme values of two variable functions, three variable functions with constraints.
- Solve the single, multiple integrals, calculate surface and volume of solids choosing suitable integral, calculate the moment of inertia.
- Calculate gradient, divergence, curl of a function. To solve line, surface and volume integrals and apply to calculate work done, area volume. Evaluate multiple integrals using suitable vector integral theorems

Course Outcomes:

At the end of the course the student will be able to:

CO1: Solve the 1st order differential equations choosing suitable method and apply to estimate population, temperature, quantity and trajectory.

CO2: Solve a 2nd and higher order differential equations with constant coefficients, choosing suitable rule & apply to LCR Circuits and Simple Harmonic equations.

CO3: Identify Taylor series and Mc Laurent's series for two variable functions and calculate extreme values of two variable functions, three variable functions with constraints.

CO4: Solve the single, multiple integrals, calculate surface and volume of solids choosing suitable integral, and calculate the moment of inertia.

CO5: Calculate gradient, divergence, curl of a function, solve line, surface and volume Integrals and apply to calculate work done, area, volume. Evaluate the multiple integrals by integrating suitable vector integral theorems.

UNIT I:

Linear Differential Equations of first order: Linear differential equations of first order and first degree – exact, linear and Bernoulli.

Applications: Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

UNIT II:

Linear Differential Equations of Second and higher order: Linear differential equations of second and higher order with constant coefficients- Complete solution, Operator D, Rules for finding complementary function, Inverse operator D, Rules for finding particular integral

with RHS term of the type e^{ax} , Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x). Method of variation of parameters.
Applications: LCR circuit, Simple Harmonic motion

UNIT III:
Partial Differentiation: Introduction-Total derivative - Chain rule - Generalized Mean Value theorem for single variable (without proof)-Taylors and Mc Laurent‟s series for two variables – Functional dependence– Jacobian.
Application: Maxima and Minima of functions of two variables with constraints and without constraints.

UNIT IV:
Multiple Integrals: Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple integrals - double and triple integrals – change of variables – Change of order of Integration-Cartesian and Polar coordinates.
Application: Moment of inertia

UNIT V:
Vector Calculus: Vector Differentiation-Gradient- Divergence- Curl - Laplacian and second order operators- Vector identies.
Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals. Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems.
Applications: Work done, Force.

TEXT BOOKS:

1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics, Volume-I, 11th editions respt., 2012, Dr. T.K.V.Iyengar & others, S. Chand Publishers.

REFERENCE BOOKS:

1. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.
2. A Text Book of Engineering Mathematics – I & II, 2nd edition, 2011, U. M. Swamy & others – Excel Books, New Delhi.
3. Advanced Engineering Mathematics, 8th edition, 2009, Erwin Kreyszig- Shree Maitrey Printech Pvt.Ltd, Noida.

ENGINEERING CHEMISTRY
(Common to All Branches)

Sub. Code: 13BS1005 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To become familiar in moulding methods of preparation of different types of plastic materials.
- To understand the determination of hardness of water sample by EDTA method.
- To understand the methods of prevention of corrosion of metal.
- To become familiar about different lubrication techniques.
- To understand about constructing the PV cell.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Differentiate different moulding techniques of plastic materials.
CO2: Determine total hardness of water by EDTA method.
CO3: Design the metallic materials to prevent corrosion.
CO4: Apply suitable lubrication mechanisms for various machinery parts.
CO5: Demonstrate the working of PV cell.

UNIT-I:
Polymers: Polymerization reactions – Basic concepts, types of polymerisation – addition and condensation polymerisations, plastics – thermosetting and thermoplastics– differences. Compounding and Moulding of plastics– Compression, injection, transfer and extrusion moulding methods. Preparation, properties and engineering uses of the following: PE, PVC, Teflon, Bakelite, Nylon, Polyesters.
Building Materials: Cement–Classification; Portland cement–raw materials, manufacture of Portlandcement, chemical constitution of Portland cement, Setting and Hardening of Portland Cement.

UNIT-II:
Water Technology: Introduction – Hardness of Water – Temporary and Permanent hardness, Units and inter conversions of Units. Estimation of hardness by EDTA Methods. Problems on Temporary and Permanent hardness. Disadvantages of Hard Water, Methods of Treatment of Water for Domestic Purposes – Sedimentation, Coagulation, Filtration, Disinfection – Sterilization, Chlorination, Break Point chlorination, Ozonisation –Industrial Water Treatment – Desalination, Reverse Osmosis Treatment - Lime-Soda Process, Zeolite Process, Ion-Exchange Process.

UNIT-III:

Science Of Corrosion: Definition, examples, Types of corrosion: Theories of corrosion and Mechanism– Dry corrosion (Direct chemical attack), Wet corrosion (Electrochemical theory) Principles of corrosion, Galvanic series, Galvanic corrosion, Concentration cell corrosion, mechanism of wet corrosion – Hydrogen evolution type, oxygen absorption type. Factors influencing corrosion control of corrosion – proper design, use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and impressed current. Modifying the environment, use of inhibitors.

UNIT-IV:

Fuel Technology: Introduction to Liquid Fuels-Classification of Crude Oil-Fractional Distillation-Cracking (Thermal &Catalytic), Synthetic Petrol (Fischer-Tropschs & Bergius Process) - Polymerization-Refining &Reforming –Knocking –Anti Knocking Agents-Octane & Cetane Number.

Lubricants: Principle and functions of lubricants – Types of lubrication and mechanism – Thick film or Hydrodynamic lubrication, Thin film lubrication, extreme pressure lubrication. Classification and properties of lubricants – Viscosity, flash and fire points, cloud and pour points, aniline points, neutralization number and mechanical strength.

UNIT-V:

Solar Energy: Introduction – harnessing solar energy – photo voltaic cells – Concentrated Solar Power Plants – green house concepts.

Green Chemistry: Introduction-12 principles of green chemistry – green synthesis - Engineering Applications

Nano Chemistry: Introduction to Nano materials-preparation of few Nano materials (Carbon Nano Tubes, Fullerenes etc)- Top down and Bottom up concepts - Properties of Nano materials- Silver and Gold Nano particles - Engineering & Biomedical applications.

TEXT BOOKS:

1. "Engineering Chemistry", P.C.Jain and Monica Jain, DhanpatRai Publications, Co., New Delhi 15th Edition.
2. "A Text Book of Engineering Chemistry", S.S. Dara, S.S.Umare, S.Chand& Co., Ltd., 12th Edition.

REFERENCE BOOKS:

1."A Text Book of Engineering Chemistry" by Dr.Sunita Rattan, S.K. Kataria& Sons (2012).
2."A Text Book of Engineering Chemistry", by S. Nagarajan, R. Gopalan, D.Venkatappayya, 3rd edition, Vikas Publishing House.
3."Engineering Chemistry" by Wiley India Editorial Team, Wiley Publishers (2011).
4. "A Text Book of Nano Science and Nano technology", by T. Pradeep, Tata Mc.Graw Hills (2012).

ELECTRONIC DEVICES

Sub. Code: 13EC1001 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To understand the impact of electric and magnetic fields on electron
- To understand the structure, properties and importance of materials (conductors, semiconductors and insulators) based on band diagrams and also understand the motion of charged particles in those materials
- To explain the operation, working , characteristics and applications of various semiconductor devices.
- To understand the working and characteristics of transistors.
- To understand the working and characteristics of JFET, MOSFET , SCR and UJT

Course Outcomes:

CO1: Describe the behavior of electron in electric and magnetic fields.
CO2: Summarize the characteristics of semiconductor materials
CO3:Distinguish the semiconductor diodes according to working principles and applications and to demonstrate the use of semiconductor diode as a rectifier.
CO4: Point out the working and behavior of transistor BJT in different configurations
CO5: Explain the working and applications of JFET, SCR, UJT and MOSFETs

Unit-I

Electron Ballistics and Applications: Force on Charged Particles in Electric field, Constant Electric Field, Potential, Relationship between Field Intensity and Potential, Two Dimensional Motion, Electrostatic Deflection in Cathode ray Tube, CRO, Force in Magnetic Field, Motion in Magnetic Field, Magnetic Deflection in CRT, Magnetic Focusing, Parallel Electric and Magnetic fields and Perpendicular Electric and Magnetic Fields.

Unit- II

Review of Semi Conductor Physics : Insulators, Semi conductors, and Metals classification using Energy Band Diagrams, Mobility and Conductivity, Electrons and holes in Intrinsic Semi conductors, Extrinsic Semi Conductor, (P and N Type semiconductor) Hall effect, Generation and Recombination of Charges, Diffusion, Continuity Equation, Injected Minority Carriers, Law of Junction, Fermi Dirac Function, Fermi level in Intrinsic and Extrinsic Semiconductor

Unit- III

Junction Diode Characteristics : Open circuited P N Junction, Forward and Reverse Bias, Current components in PN Diode, Diode equation,Volt-Amper Characteristic, Temperature Dependence on V – I characteristic, Step Graded Junction, Diffusion Capacitance and Diode Resistance (Static and Dynamic), Energy Band Diagram of PN Diode,

Special Diodes: Avalanche and Zener Break Down, Zener Characteristics, Tunnel Diode, Characteristics with the help of Energy Band Diagrams, Varactor Diode, LED, PIN Diode, Photo Diode, Schott key Diode, Trouble shooting and Specifications.
Diode Applications: Half wave rectifier, ripple factor, full wave rectifier (with and without transformer) and Harmonic components in a rectifier circuit.

Unit IV
Transistors:
Junction transistor, Transistor current components, Transistor as an amplifier, Characteristics of Transistor in Common Base and Common Emitter Configurations, Analytical expressions for Transistor Characteristics, Punch Through/ Reach Through, Photo Transistor, Trouble shooting, Transistor Specifications.

Unit V
Field Effect Transistors:
JFET, Comparison between BJT & JFET, JFET characteristics and parameters, MOSFET, MOSFET characteristics (Enhancement and depletion mode), Lateral double diffused MOSFET (LDMOSFET), V-grove MOSFET (VMOSFET), Dual Gate MOSFET, Trouble shooting, Specifications.
Introduction to SCR and UJT and their characteristics.

Text Books :
1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill.
2. Electronic Devices - FLOYD 5th Edition , Pearson Education.

Reference:
1. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill, 2009.
2. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA McGraw Hill, Second Edition.
3. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition, 2006.

ENGINEERING MECHANICS

(Common for Civil, EEE, ECE, CSE&IT branches)

Subject Code: 13ME1003 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- Solve problems using vectorial and scalar representation of forces and moments.
- Draw free-body diagrams and solve statics problems using resultant force, moment about a point and equations of equilibrium
- Comprehend the effect of friction on equilibrium.
- Calculate centre of gravity and moment of inertia for different cross sections
- Calculate velocities and accelerations of a particle having rectilinear or curvilinear motion.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Solve problems using vectorial and scalar representation of forces and moments

CO2: Draw free-body diagrams and solve statics problems using resultant force, moment about a point and equations of equilibrium

CO3: Comprehend the effect of friction on equilibrium.

CO4: Calculate centre of gravity and moment of inertia for different cross sections

CO5: Calculate velocities and accelerations of a particle having rectilinear or curvilinear motion.

UNIT- I:

Systems Of Forces: Introduction–parallelogram law–Forces and components - Resultant of coplanar concurrent forces – component forces - vector notation – moment of force – principle of moments – couples - Resultant of planar force systems.

UNIT –II:

Equilibrium Of Force Systems: Equilibrium–free body diagrams–Equations of equilibrium–equilibrium of planar systems – graphical methods and analytical methods for equilibrium of planar systems – Moment of a Force and its applications, Varignon's theorem

UNIT- III:

Friction: Introduction, limiting friction–types of friction and friction laws–application of friction - Inclined plane, friction of screw and nuts – screw jack.

Centroids and Center Of Gravity: Centre of gravity–centroids of area and lines–determination ofcentroids by integration – centroids of composite figures – theorems of Pappus.

UNIT- IV:

Area Moment Of Inertia : Moment of inertia–polar moment of Inertia–Radius of gyration - Transfer theorem for moment of Inertia – Moment of inertia of composite areas – product of inertia – Transfer formula for product of Inertia.

Mass Moment Of Inertia: Moment of inertia of masses–Radius of gyration–Transfer formula for mass moment of inertia – Mass moment of Inertia by Integration**.**

UNIT -V:

Kinematics: Rectilinear motion-curvilinear motion–Rectangular components of curvilinear motion - Normal and Tangential components of acceleration, Radial and transverse components - Kinematics of rigid bodies - angular motion – fixed axis rotation – Definition and analysis of plane motion.

Kinetics: Kinetics of rigid bodies–equation of planes motion–fixed axis rotation–rolling bodies (simple examples)- general plane motion (Simple examples).

TEXT BOOKS:

1. I.B. Prasad: Applied Mechanics, Khanna Publishers, 19th Edition, 2009.
2. Ferdinand L. Singer: Engineering Mechanics, Harper Collins Publishers India, 3rd Edition, 2008.
3. A.K. Tayal: Engineering Mechanics, Umesh Publishers, 13th Edition, 2008.

REFERENCES:

1. Irving. H. Shames: Engineering Mechanics, PHI Publishers, 4th Edition, 2008.
2. Timoshenko & Young: Engineering Mechanics, MGH Publishers, 4th Edition, 2010.
3. K.L. Kumar, Engineering Mechanics, TMH Publishers, 3rd Edition, 2009.
4. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill.
5. Engg. Mechanics / S.S. Bhavikati & J.G. Rajasekharappa.

ENGINEERING CHEMISTRY LAB
(Common to All Branches)

Subject Code: 13BS1102 **Internals: 25**
Credits: 2 **Externals: 50**

Course Objectives:

The students completing this course are expected to understand:

- To understand the determination of D.O., Turbidity of water sample.
- To become familiar about the determination of viscosity, flash point and acid value of oil.
- To learn concepts about the pH and conduct metric titrations.
- To understand the determination of hardness of water sample by EDTA method.
- To become familiar about all the instruments in the chemistry laboratories.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Determine D.O., Turbidity etc of water sample.
CO2: Explain the importance of viscosity, Flash point and Acid value of a lubricant.
CO3: Determine the amount of acid or base by pHmetric and conduct metric titrations.
CO4: Determine the hardness of various water samples.
CO5: Operate all the instruments in the chemistry laboratory.

LIST OF EXPERIMENTS:
(Any Twelve experiments have to be completed)

1. Determine the Acid Value present in the given lubricating oil.
2. Determine the Flash and Fire points of given Oil Sample.
3. Determine the Kinematic Viscosity of a given oil sample by using Viscometer.
4. Estimate the amount of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
5. Determine the Total Hardness present in the given water sample by using EDTA Method.
6. Estimate the amount of Turbidity present in the given water sample by using Turbidity meter.
7. Estimate the Viscosity of an Organic Solvent by using Ostwald Viscometer.
8. Prepare Phenol-Formaldehyde Resin and calculate its weight.
9. pH metric Titrations between Strong acid and Strong base.
10. pH metric Titrations between Strong acid and Weak base.

11. Conductometric Titrations between Strong acid and strong base.
12. Conductometric Titrations between Strong acid and Weak base.
13. Colorimetric estimation of Iron (III).
14. Estimate the amount of Calcium present in given cement sample.

TEXT BOOKS:

1. Practical Engineering Chemistry by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011)
2. "Lab Manual on Engineering Chemistry" by Dr.Sudharani, DhanpatRai Publications, Co., New Delhi. (2010)

REFERENCES:

1. Engineering Chemistry Lab Manual: SCITECH, ShuchiTiwari (2010)
2. "Vogel Text Book of Quantitative Chemical Analysis", 6thEdition by G.J.Jeffery, J.Bassett, J.Mendham, R.C. Denney, Longman Scientific & Technical Publications, Newyork.
3. "A Text Book of Engineering Chemistry" by R.N.Goyal and HarmendraGoel, Ane Books, India.
4. "A Text Book on experiments and calculations Engineering, S.S. Dara", S.Chand& Co., Ltd., (2003)
5. Instrumental methods of Chemical Analysis, Chatwal, Anand, 5th Edition, Himalaya Publications.

ELECTRONIC WORKSHOP

Subject code : 13EC1101 **Internal Marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives:
The students completing this course are expected to understand:

- Identification of specifications and testing of passive components and switches (SPDT, DPDT, and DIP)
- Study and working of relays, bread boards, microphones and loud speakers
- Interpretation of electronic devices like Diodes and Transistors
- Design and development of electronic circuits on PCB
- Understanding the functioning of Power Supplies and measuring equipments (Multimeters, CROs and Function generators etc.)

Course Outcomes:
At the end of the course the student will be able to:
CO1: Identify and test various passive components.
CO2: Recognize different types of switches (SPDT, DPDT, and DIP)
CO3: Infer the operation of relays, bread boards, microphones and loud speakers.
CO4: Design a circuit on the PCB
CO5: Use different electronic equipment used in electronic laboratories

LIST OF EXPERIMENTS:

1. Identification, specifications and testing of R, L, C Components (Colour Codes), potentiometers, gang condensers.
2. Identification, specifications and testing of switches (SPDT, DPDT, and DIP).
3. Study and working of relays and bread boards.
4. Study and working of microphones and loud speakers.
5. Soldering practice – simple circuits using active and passive components.
6. Single layer and multi layer PCBs (Identification and Utility).
7. Study and operation of volt and ammeters.
8. Study and operation of multimeters (Analog and Digital)
9. Study and operation of function generators.
10. Study and operation of regulated power supplies.
11. Study and operation of cathode ray oscilloscope (CRO).

I T WORKSHOP

(Common to All Branches)

Subject Code: 13CS1103 **Internal Marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives:

- Identify the peripherals of a computer and every student should install windows and Linux operating system.
- Awareness on different problems of personal computer and learn Hardware and Software trouble shooting.
- Awareness on Internet ,web browsers, search engines , cyber hygiene i.e, protecting the personal computer from getting infected with the virus ,worms and other cyber attacks would be introduced
- Productivity tools module would enable the students in crafting professional Word documents; Excel spread sheets, Power point presentations and publisher.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Identify the peripherals of a computer, assemble and disassemble the computer system.

CO2: Complete the Installation of operating system and solve problems related to hardware and software in computer system.

CO3: Create, Edit, Format word documents and power point presentations.

CO4: Create, Organize and analyze data within an Excel spreadsheet.

CO5: Develop a basic understanding of technologies and protocols used on the Internet, and how to effectively use Internet tools technologies including current web-based applications, e-mail, and search engines

PC Hardware:

Week-1- Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 2 –Task 2: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Week 3 –Task 3: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a

Viva. Several mini tasks would be that covers Basic commands in Linux and Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, Using wildcards

Week 4 – Task 4: Hardware Trouble shooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Software Trouble shooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Internet & World Wide Web

Week 5 - Task 1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 6 - Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Word:

Week 7 –Word Orientation : The mentor needs to give an overview of Microsoft/ equivalent (FOSS) tool word : Importance of MS/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1: Using word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both Word.

Week 8 - Task 2 : Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes.
Task 3: 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 and Paragraphs

Week 9-Task 4: Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel
Week 10 - Excel Orientation: The mentor needs to tell the importance of MS/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources

Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Week 11 - Task 2: Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP / VLOOKUP
Task 3: Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Week 12-Task 4: Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

MS/equivalent (FOSS) tool Power Point

Week 13 - Task1: Students will be working on basic power point utilities and tools which help them create basic 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 in Power-point.

Week 14 -Task 2: Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts, Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

Week 15 - Task 3: Entire week concentrates on presentation part of power point. Topic covered during this week includes -Using Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing.

Publisher

Week 16: Help students in preparing their personal website using Microsoft/ equivalent (FOSS) tool publisher. Topic covered during this week includes - Publisher Orientation, Using Templates, Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, Hosting website.

TEXT BOOKS:

1. "Comdex Information Technology course tool kit" : Vikas Gupta, WILEY Dreamtech
2. "The Complete Computer upgrade and repair book", 3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.
4. "PC Hardware and A+ Handbook" – Kate J. Chase PHI (Microsoft)
5. All others related material is available at
    (a) www.sssolutions.in
    (b) www.sontisoftsolutions.org

ENGLISH – II
(Common for all Branches)

Subject Code: 13HS1002 **External Marks: 70**
Credits: 02 **Internal Marks: 30**

Course Objectives:

- To improve the language proficiency of a technical under-graduate in English with emphasis on LSRW skills.
- To provide learning environment to practice listening, speaking, reading and writing skills.
- To assist the students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.
- To expose the students to a variety of self-instructional modes of language learning.
- To develop learner autonomy.

Course Outcomes:

At the end of the course:

CO1: Students will be able to use English language in their day-to-day life.

CO2: Students will be able to employ LSRW skills within and beyond the classroom environment.

CO3: Students will be able to integrate English Language Learning with employability skills.

CO4: Students will be able to relate classroom language learning to the real life situations.

CO5: Students will be able to interpret things and draw inferences accordingly.

UNIT –I:
Globalization by Joseph Stiglitz
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

UNIT - II:
My Early Days by Dr. A. P. J. Abdul Kalam
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

UNIT -III:
I have a Dream by Martin Luther King
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

UNIT -IV:
The Cop and the Anthem by O. Henry
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

UNIT -V:
Telephone Conversation by Wole Soyinka
Reading – Vocabulary – Essential Grammar – Writing – Classroom activities.

REFERENCES:

1. Preparing for the Future Ed. D. Ravikumar et al. Maruti Publishers
2. Wings of Fire – APJ Abdul Kalam
3. Short Stories – O. Henry
4. 30 days to a more Powerful Vocabulary by Norman Lewis and Wilfred Funk.

COMPUTER PROGRAMMING
(Common to All Branches)

Subject Code: 13CS1001 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To develop programming skills using the fundamentals and basis of C language
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in the file organization and the usage of file systems.
- To impart the knowledge about pointers which is the backbone of effective memory handling
- To study the advantages of user defined data type which provides flexibility for application development

Course Outcomes:

At the end of the course the student will be able to:
CO1: Understand the fundamentals of C programming.
CO2: Choose the loops and decision making statements to solve the problem.
CO3: Implement different operations on arrays and solve problems using functions.
CO4: Understand pointers, structures and unions.
CO5: Implement file operations in C programming for a given application.

UNIT I:
Problem Solving: Definition of a Problem, A Framework for Problem Solving, Classification of Problems, Algorithms /Pseudo code- Definition, Properties, Flowchart- Introduction, Introduction to RAPTOR Tool, Flowchart examples for simple computational problems, Program Development Steps, Computer Languages- Machine, Symbolic and High-level, Creating and Running Programs: writing, editing, compiling, linking and executing.

C Fundamentals, Character set, C tokens (Identifier and Keywords, Data types, Constants, variables), Declarations, Expressions, Statements

C Operators: Arithmetic, Unary, Relational and Logical, Assignment and Conditional Operators, Library Functions. Bit Operations and Boolean Logic

UNIT II:
Control Structures: if statement, if…else statement-various forms of if, nested if.
Iterative Loops: while, do-while and for statements, initialization and updating, event and counter controlled loops, looping applications, break statement, continue statement, go to statement, switch statement, nested switch statement, comma statement.

UNIT III:

Functions – Modular Programming: Functions, basics, parameter passing, Storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions, header files, example c programs. Passing 1-D arrays, 2-D arrays to functions, parameter passing mechanisms (passing by value), storage classes (auto, register, extern, static), scope of variable

Arrays: Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings concepts, String handling functions and string manipulations, 1-D arrays, 2-D arrays and character arrays, Multidimensional arrays , Array applications: Matrix Operations

UNIT IV:

Pointers: Pointer definition, pointers concepts, initialization of pointer variables, pointers and function arguments, passing by address, dangling memory, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

Enumerated, Structure And Union Types: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, type def, bit-fields, program applications.

UNIT V:

File Handling: Input and output–concept of a file, Creating, processing, opening and closing–Bitwise Operations, text files and binary files, Formatted I/o, file I/o operations, example programs. C pre-processor

TEXT BOOKS:

1. "The C– Programming Language", B.W. Kernighan, Dennis M. Ritchie, PHI
2. "Let Us C", Yashwant Kanitker, Second Edition

REFERENCE BOOKS:

1. "C and data structures: A Snap Shot Oriented Treatise Using Live Engineering Examples" by Dr. N.B. Venkateswarlu, S Changd & Co, New Delhi.
2. "C Programming: A Problem- Solving Approach", Forouzan, E. V. Prasad, Giliberg, Cengage, 2010.
3. "Programming in C", Stephen G. Kochan, 3/e Pearson, 2007
4. Web-link http://raptor.martincarlisle.com/

ENGINEERING MATHEMATICS – II
(Common to all branches)

Subject Code: 13BS1002 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- Solve the algebraic and transcendental equations, using different numerical method. Estimate the best curve for a given data.
- Calculate the value of dependent variable for a particular x by deducing the unknown function y=f(x) for an evenly or unevenly spaced points, estimate the value of derivatives, evaluate the definite integrals using different numerical methods.
- Identify different formal language classes and their relationships
- To calculate the numerical solution of an ordinary differential equation i.e IVP
- Evaluate Laplace transform of continuous functions using Laplace transform formulae & properties. Apply Laplace transform to solve I.V.P &B.V.P
- Solve linear and non-linear 1st order partial differential equation. Evaluate wave equations & heat equations, using method of separation of variables.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Can solve the algebraic and transcendental equations by different numerical methods And estimate a linear and non-linear curve to the given data by the method of least squares

CO2: Can calculate the value of dependent variable for a particular x by deducing the Unknown function y =f(x) for an evenly or unevenly spaced points, estimate the value of derivatives, evaluate the definite integrals using different numerical methods.

CO3: Can calculate the numerical solution of an ordinary differential equation i.e. IVP.

CO4: Can evaluate Laplace transform of continuous functions using Laplace transform formulae & properties. Apply Laplace transform to solve I.V.P & B.V.P

CO5: Can solve linear and non-linear 1st order partial differential equation. Evaluate wave equations & heat equations using method of separation of variables.

UNIT -I:

Algebraic and Transcendental Equations and Curve fitting: Solution of Algebraic and Transcendental Equations- Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

UNIT-II:

Interpolation and Numerical Differentiation and Integration:

Interpolation- Introduction – Finite differences- Forward Differences – Backward differences –Central differences – Symbolic relations and separation of symbols-Differences

of a polynomial – Newton's formulae for interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula.
Numerical Differentiation and Integration – Differentiation using finite differences – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

UNIT-III:
Numerical solution of Ordinary Differential equations: Solution by Taylor's series – Picard's Method of successive Approximations – Euler's and Modified Euler's
Method – Runge – Kutta Methods – Predictor – Corrector Methods – Milne's Method.

UNIT-IV:
Laplace and Inverse Laplace transforms: Laplace transforms of standard functions – Shifting Theorems, Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem.
Application: Solution of ordinary differential equations using Laplace transforms.

UNIT-V:
Partial Differential equations: Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and non-linear (standard type) equations. Solution of linear Partial differential equations with constant coefficients – Method of Separation of Variables.
Applications: One dimensional Wave and Heat equations.

TEXT BOOKS:
1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods, Himalaya Publishing House, Bombay.

REFERENCE BOOKS:
1. Mathematical Methods, 6th edition, 2011, Dr. T. K.V.Iyengar & others S. Chand Publications.
2. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.
3. Engineering Mathematics Volume-II, 6th edition, 2012, T.K.V Iyengar, &others, S.Chand Co. New Delhi.

ENGINEERING MATHEMATICS – III

(Common to All Branches)

Subject Code: 13BS1003 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- Calculate the rank of a matrix, solve linear system of equations by different methods and apply the knowledge to find the current in an electric circuit.
- Understand the concept of eigen values, eigen vectors, Cayley's Hamilton theorem and its applications. Also to acquire the knowledge of reduction of quadratic to canonical form and its applications.
- Determine the Fourier series expansion, half range series of different functions in different intervals, Fourier & Inverse Fourier transforms of different functions and apply the same to solve problems.
- Acquire the knowledge of Z- transforms and inverse Z-transforms of different functions, study their properties and solve difference equations.
- Study the Beta and Gamma functions, their properties and apply to solve improper integrals.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Can calculate the rank of a matrix, solve a linear system of equations and apply the knowledge to calculate the current in a electrical circuit.

CO2: Can calculate the eigen values, eigen vectors, use Cayley's Hamilton theorem to calculate inverse and powers of a matrix. Reduce a quadratic form to canonical form and find its nature and calculate solution of free vibration of two mass systems.

CO3: Can find the Fourier series, half range series expansion of different functions in different intervals, Fourier & inverse Fourier transforms of different functions and apply to solve definite integrals.

CO4: Can calculate the z- transforms and inverse z-transforms of different functions and apply the same to solve the difference equations.

CO5: Can apply Beta and Gamma functions to solve improper integrals.

UNIT -I:

Matrices: Rank of Matrix- Echelon form, Normal form – Solution of Linear System of equations – Direct methods, Gauss elimination, Gauss Jordan and Gauss Seidal Methods. Application: Finding the current in a electric circuit.

UNIT -II:

Eigen values, Eigen vectors & Quadratic forms: Eigen values - Eigen vectors – Properties – Cayley -Hamilton Theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index – signature.
Applications: Free vibration of a two mass system.

UNIT -III:

Fourier series and Fourier Transforms: Fourier series- Determination of Fourier coefficients (without proof) – Fourier series – even and odd functions – Fourier series in an arbitrary interval– Half-range sine and cosine series. Fourier integral theorem (only statement) – Fourier sine and cosine integrals - Fourier transform – sine and cosine transforms – properties – inverse Fourier transforms – Finite Fourier transforms.

UNIT -IV:

Z- Transforms: Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems -Inverse z-transform – Partial fractions, Convolution theorem.
Application: Solution of Difference equations by Z-transforms.

UNIT- V:

Special functions: Gamma and Beta Functions – Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.
Application: Evaluation of integrals.

TEXT BOOKS:

1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics Volume - II, 6th editions respt., 2012, T.K.V Iyengar, & others, S.Chand Co. New Delhi.

REFERENCE BOOKS:

1. Mathematical Methods, 4th edition, 2009, B.V Ramana, Tata McGraw Hill, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods, Himalaya Publishing House, Bombay.
3. Dean G. Duffy, Advanced engineering mathematics with MatLab, CRC Press.
4. Advanced Engineering Mathematics, 8th edition, 2009, Erwin Kreyszig- Shree Maitrey Printech Pvt.Ltd, Noida.

ENGINEEIRNG PHYSICS
(Common to all Branches)

Subject Code: 13BS1004 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:
- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Lasers and Fiber Optics
- To appreciate general principles of crystal and molecular structures and infer X-ray diffraction as an experimental method for determining crystal structures
- To possess an insight on Magnetic Properties and Dielectric Materials pertaining to Material Fabrication
- To define the shortcoming of classical physics and describe the need for modifications to classical theory

Course Outcomes:
At the end of the course student will be able to
CO1: Apply the principles of optics in designing optical devices
CO2: Outline the Principles of Lasers and Fiber Optics
CO3: Explain general principles of crystal and molecular structures and infer X-ray diffraction as an experimental method for determining crystal structures
CO4: Interpret the knowledge of Magnetic Properties and Dielectric Materials in Material Fabrication
CO5: Resolve the discrepancies in classical estimates through quantum principles

UNIT- I:
Wave Optics:
Interference: Introduction, Principle of Superposition of Waves, Coherence –Young's Double Slit Experiment – Intensity Distribution and Fringe Width, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light.
Diffraction: Introduction, Types of Diffraction [Fresnel & Fraunhofer], Fraunhofer Diffraction due to Single Slit – Intensity Distribution Differences between Interference and Diffraction,

UNIT-II:
Lasers & Fiber Optics:
Lasers: Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission; Einsteins's Coefficients, Population Inversion, Optical Resonatorand Lasing Action, Ruby Laser, Helium-Neon Laser, Applications of Lasers in Industry, Scientific and Medical Fields.
Fiber Optics: Introduction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Optical Fiber Construction, Types of Optical Fibers – Step Index Fibers and Graded Index Fibers, Differences between Step Index Fibers and Graded Index Fibers, Differences between

Single Mode Fibers and Multimode Fibers, Advantages of Optical Fibers in Communications.

UNIT-III:

Introductory Solid State Physics:

Crystal Structure: Introduction, Basic Terms – Lattice, Basis, Crystal Structure, Coordination Number, Atomic Radius, Packing Fraction, Free Volume, Lattice Parameters, Unit Cell and Primitive Cell, Crystal Systems and Bravais Lattices, Structure and Packing Fractions of Simple Cubic, Body Centered Cubic and Face Centered Cubic Crystal Structures.

X-Ray Diffraction: Crystal Planes, Directions and Miller Indices, Distance of Separation between successive hkl Planes – Inter Planar Spacing, Diffraction of X-Rays by Crystal Planes – Bragg's Law;

UNIT-IV:

Essentials of Material Science:

Magnetic Properties: Introduction, Basic Terms – Magnetic Flux (φ), Magnetic Flux Density or Magnetic Field Induction (B), Magnetic Field Intensity or Magnetic Field Strength (H), Intensity of Magnetization (I), Permeabilty (μ) & Relative Permeability (μ_r) and Susceptibility (χ), Relation between B, H & I, Relation between Relative Permeability and Susceptibility, Origin of Magnetic Moment – Bohr Magneton, Classification of Magnetic Materials – Dia, Para and Ferro, Domain Theory of Ferromagnetism – Hysteresis Curve; Soft and Hard Magnetic Materials.

Dielectric Properties: Introduction, Basic Terms – Electric Field (E), Electric Dipole, Electric Dipole Moment (μ_e), Polarizability (α), Polarization Vector (P), Displacement Vector (D), Permittivity (ε) and Relative Permittivity or Dielectric Constant (ε_r), and Electric Susceptibility (χ_e), Relation between D, E & P, Relation between Relative Permittivity and Susceptibility, Electronic Polarizability, Ionic Polarizability, Orienational Polarizability and Total Polarizability, Definitions of Ferro Electricity and Piezoelectricity

UNIT-V:

Preliminary Quantum Mechanics & Free Electron Theory :

Free Electron Theory: Introduction, Classical Free Electron Theory, Mean free path, Relaxation time, Drift velocity, Mobility, Current Density and Electrical Conductivity,

Preliminary Quantum Mechanics: Introduction, Waves and Particles, Wave Particle Duality and De-Broglie Hypothesis, Experimental Verification – G. P. Thomson Experiment, Time independent Schrödinger wave equation, Physical Significance of Wave Function, Particle in One Dimensional Potential Box.

TEXT BOOKS:

1. Engineering Physics by Mani Naidu, Pearson Publications Chennai
2. A Text Book of Engineering Physics by Ksheera Sager and Avadhanulu
3. Engineering Physics by Gaur and Gupta.

REFERENCES:

1. University Physics by Young and Freedman 12th Edition.
2. Fundamental of Physics by Resnick, Halliday and Walker

ENGINEERING DRAWING
(Common to all Branches)

Subject Code: 13ME1001 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- Introduce concepts in automata theory and theory of computation
- Identify different formal language classes and their relationships
- Prove or disprove theorems in automata theory using its properties
- Determine the decidability and intractability of computational problems

Course Outcomes:

At the end of the course the student will be able to:

CO1: Construct polygons, conic sections (ellipse, parabola and hyperbola) and scales (Plain, diagonal and vernier)
CO2: Draw orthographic projection of points and straight lines in any quadrant, and determine its true length and true inclination.
CO3: Draw projections of plane surfaces inclined to either one or both reference planes.
CO4: Draw projections of simple solids inclined to one reference plane.
CO5: Convert orthographic views into isometric projections and vice-versa.

UNIT-I:
Lettering and Dimensioning: Introduction to various terms; instruments IS 9609 provision, lettering practice. Elements of dimensioning and systems of dimensioning.
Construction of scales: Plain Scale, Diagonal & Vernier Scales.
Geometric Constructions and Engineering Curves: Construction of Polygons, Construction of Conicsections–parabola, ellipse and hyperbola using General Method, construction of ellipse using oblong, arc's of circles and concentric circles methods.

UNIT- II:
Orthographic Projections: First and Third Angle Projections:
Projections of Points. Projections of Straight Lines inclined to one reference plane.

UNIT -III:
Projections of planes - Perpendicular planes & planes inclined to one reference plane and both reference planes.

UNIT –IV:
Projections of solids: Classification of solids. Projections of Prism, Cylinder, Pyramid & Cone inclined to one reference plane.

UNIT- V:

Conversion of Orthographic Projections to Isometric Projections: Conversion of Orthographic View to Isometric views

Conversion of Isometric Projection to Orthographic Projections: Conversion of Isometric view to Orthographic views

TEXT BOOKS:

1. Engineering Drawing, by N. D. Bhat & V. M Panchall, Charotar Publishing House.
2. Engineering Drawing, by K.L.Narayana & P.Kanniah

REFERENCE BOOKS:

1. K. Venugopal, Engineering Drawing and Graphics, 2nd Ed. New Age International.
2. Luzadder, Warren, J. and Jon. D. M., "Fundamentals of Engineering Drawing", 11thEdition, Prentice Hall India.

BASIC ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

(Common for all Branches)

Subject Code: 13HS1101 **Internal Marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives:

- To improve the communication skills through Listening & Practicing the structures of language.
- To make the students to adopt themselves to the situations and converse using their spontaneity.
- To make the students acquiring the language proficiency.
- To make them realize the importance of Stress, Intonation and Rhythm of language.
- To make the students to improve pronunciation, vocabulary, language skills, communication skills, body language and grammar to fulfill the demands of the employer.

Course Outcomes:

At the end of the course:

CO1: Students will be able to transform themselves into effective speakers of English.

CO2: Students will be able to emulate the language properly and relate it to the real life situations.

CO3: Students will be able to acquire and make use of LSRW skills rather productively.

CO4: Students will be able to point out stress on the words and apply rhythm in their speech.

CO5: Students will be able to apply know-how of vocabulary efficiently depending on the context words are used in.

List of Sessions

UNIT-I: Introduction to Phonetics, Sentences and its applications and listening skills.
UNIT-II: Consonant Sounds, Parts of Speech & Speaking skills.
UNIT-III: Vowel Sounds, Tenses & Writing skills.
Unit-IV: Syllable & Stress, voice & Writing skills.
UNIT-V: Rhythm & Intonation, Reported Speech & Situational Dialogues.

TEXT BOOKS:

1. "Speak Well" by K. Nirupa Rani, Jayashree Mohan Raj, B. Indira, Orient Blackswan, Hyderabad (2012)
2. "Strengthen your Steps" by Dr. M. Hari Prasad, Dr. John Varghese, Dr. R. Kishore Kumar, Maruthi Publications, Hyderabad (2010)

REFERENCES:

1. A Text Book of English Phonetics: For Indian Students by T. Balasubramanian, Macmillan Publishers India (2000)
2. Better English pronunciation by J.D.O'Connor, Cambridge University Press,23-Oct-1980.
3. Practical English Usage by Michael Swan.

ENGINEEING PHYSICS LAB

Subject Code: 13BS1101 **Internal marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives:

- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To use classic experimental techniques to understand the Phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties
- To operate optical systems and design Instrumentation thereof with targeted accuracy with physical measurements
- To attain ability to use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To characterize magnetic, dielectric and semiconducting material devices

Course Outcomes:

At the end of the course student will be able to

CO1: infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum

CO2: apply classic experimental techniques to comprehend the Phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties

CO3: demonstrate the ability to measure properties of optical systems and design Instrumentation thereof with targeted accuracy for physical measurements

CO4: illustrate Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics

CO5: evaluate characteristics of magnetic, dielectric and semiconducting materialdevices

LIST OF EXPERIMENTS:

(Any Twelve Experiments have to be completed)

1. Determination of Rigidity Modulus of the Material of Wire using Torsional Pendulum
2. Verification of Laws of Transverse vibrations in Stretched Strings using Sonometer
3. Wedge method – Determination of Thickness of Thin Object (hair)
4. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
5. Determination of Acceleration due to Gravity (g) using Compound Pendulum
6. Determination of Energy Band Gap using the given Semiconductor Diode
7. Newton's Rings – Determination of the Radius of Curvature of given Convex Lens
8. Slit Width Determination with Single Slit Diffraction Phenomena using LASER
9. Determination of Thermal Coefficient using Thermistor
10. Determination of Wavelength of Monochromatic Source using LASER Diffraction

11. Determination of the Frequency of the given Tuning Fork using Volume Resonator
12. Study of the variation of Magnetic Field along the axis of a Circular Coil using Stewart and Gee's Method.
13. Diffraction Grating - Normal Incidence Method; Determination of Wavelength of given Source of Light using Spectrometer
14. Melde's Experiment – Determination of the Frequency of the Electrically Driven Tuning Fork
15. AC Sonometer – Determination of Frequency of AC Supply

MANUAL / RECORD BOOKS:

1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.
2. Lab Manual of Engineering Physics by Dr.Y. Aparna and Dr. K. Venkateswara Rao (VGS books links, Vijayawada)

COMPUTER PROGRAMMING LAB
(Common to All Branches)

Subject Code: 13CS1101 **Internal Marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives:

- To impart adequate knowledge on the need of programming languages and problem solving techniques
- To develop programming skills using the fundamentals and basis of C language
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in the file organization and the usage of file systems.
- To impart the knowledge about pointers which is the backbone of effective memory handling
- To study the advantages of user defined data type which provides flexibility for application development

Course Outcomes:

At the end of the course the student will be able to:

CO1: Recall and implement different basic concepts like data types, input/ output and decision making statements

CO2: Describes and implement usage of loop control and array operations.

CO3: Apply knowledge to implement functions and their usage.

CO4: Analyze the representation of memory using pointers and dynamic memory allocation.

CO5: Familiar with the importance and implementation of structures and unions

CO6: Exposed to implement file handling concepts

Exercise 1:

a) Write C programs for calculating • Temperature conversions • Income tax□ Area of triangle
b) Write a C program that reads an integer ‘n’ and rotate ‘n’ bit positions
c) Write a C program to swap contents of two variables without using third variable.

Exercise 2:

a) Write a C program to find the student’s grade for given marks.
b) Write a C program to find the greatest of 3 given numbers.
c) Write a C program which takes two integer operands and one operator from the user, perform the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 3:

a) Write a C program to find the sum of individual digits of a positive integer.
b) Write a C program to generate the first 'n' terms of the Fibonacci sequence.
c) Write a C program to generate all the prime numbers between 1 and 'n'.
d) Write a C program to find the reverse a given number.

Exercise 4:

a) Write a C program for Addition and multiplication of two Matrices.
b) Write a C program to find the transpose of a matrix in in-place manner.

Exercise 5:

Write a C program that uses functions to perform the following operations:

a) To insert a sub-string in to given main string from a given position.
b) To delete n Characters from a given position in a given string.
c) Simple programming examples to manipulate strings.
d) Verifying a string for its palindrome property

Exercise 6:

Write C programs that use both recursive and non-recursive functions for the following

a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

Exercise 7:

a) Write a C functions to find both the largest and smallest number of an array of integers.
b) Write a C function that uses functions to perform the following:
i) that displays the position/ index in the string S where the string T begins, or –1 if S doesn't contain T.
ii) to count the lines, words and characters in a given text.

Exercise 8:

a) Write a C function to generate Pascal's triangle.
b) Write a C function to construct a pyramid of numbers.
c) Write a C function to read in two numbers, x and n, and then compute the sum of this geometric progression:$1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$

Exercise 9:

a) Write a C program Pointer based function to exchange value of two integers using passing by address.

b) Write a C program which explains the use of dynamic arrays.

c) Write a C program to enlighten dangling memory problem (Creating a 2-D array dynamically using pointer to pointers approach.

Exercise 10:

Write a C programs for Examples which explores the use of structures, union and other user defined variables

Exercise 11:

Write a C program that uses functions to perform the following operations using Structure:

a) Reading a complex number b) Writing a complex number
c) Addition of two complex numbers d) Multiplication of two complex numbers

Exercise 12:

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)

REFERENCE BOOKS:

1. C and data structures – Dr. N.B Venkateswarlu, B.S. Publications.
2. C Programming: A Problem - Solving Approach, Forouzan, E. V. Prasad, Giliberg, Cengage, 2010.
3. Programming in C, Stephen G. Kochan, 3/e Pearson, 2007
4. The C – Programming Language" B.W. Kernighan, Dennis M. Ritchie, PHI

ENGINEERING WORKSHOP

(Common to all Branches)

Subject Code: 13ME1101 **Internal Marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives:

- Make half-lap, mortise & tenon, corner dovetail or bridle wooden joints.
- Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
- Forge MS rod from round to square cross-section, or into L- or S- bend.
- Fabricate MS pieces into either a straight, square, dovetail or V-fit.
- Connect a staircase or a tube light house-wiring electrical circuit.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Make half lap , mortise and Tenon and bridle wooden joints

CO2: Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe

CO3: Forge MS rod from round to square cross section or into L or S bend

CO4: Fabricate MS pieces into either a straight square, dovetail or V- fit

CO5: Connect a stair case or a tube light house wiring electric circuit

I. Wood Working Technology: Familiarity with different types of woods used and tools used in wood working technology.

Tasks to be performed:

1) To make Half – Lap joint 2) To make Mortise and Tenon joint
3) To make Corner Dovetail joint 4) To make Briddle joint

II. Sheet Metal Working : Familiarity with different types of tools used in sheet metal working, developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.

Tasks to be performed:

1) To make Square Tray 2) To make Taper side Tray
3) To make Conical Funnel 4) To make Elbow Pipe.

III. Forging Technology: Familiarity with different types of tools used in forging technology. Knowledge of different types of furnaces like coal fired, electrical furnaces etc...

Tasks to be performed:

1) To make round M.S rod to square 2) To make L bend in given M.S. Rod.bar
3) To make S bend in given M.S. Rod. 4) To perform heat treatment tests like annealing, Normalizing etc...

IV. Fitting Technology: Familiarity with different types of tools used in fitting technology.

Tasks to be performed:

1) To make "V" – fitting 2) To make square fitting
3) To make Dovetail fitting 4)To make Straight fitting

V. House Wiring:
1) Tube light connection
2) Staircase connection

Note: **Any two jobs from each trade must be performed by the student.**

ELECTRONIC CIRCUITS – I

Subject Code: 13EC2002 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To study the concepts of Rectifiers, filters and regulators.
- To understand the fundamentals of biasing of BJT & FET and its Stabilization.
- To list the parameters of BJT & FET when used them as an amplifier.
- To understand how H parameters are simplified as used them as an amplifier.
- To study BJT & FET at high frequency model.

Course Outcomes:
At the end of the course the student will be able to:

CO1: Recognize functionalities of diode, inductor and capacitor in rectifiers, filters and regulators. .
CO2: Estimate operating point of BJT & FET for different regions with stable conditions.
CO3: Label the BJT and FET parameters when they are used as an amplifier.
CO4: Analyze the simplified h-parameter equations for BJT use an amplifier and also the fundamentals of miller theorem.
CO5: Operate BJT & FET on high frequency mode.

Unit – I
Filters and Regulators: Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L – section filter, Π - section filter, Multiple L – section and Π - section filters. Comparison of filter circuits, Simple regulator circuits using Zener diode.

Unit – II
Transistor Biasing and Stabilization: Operating point, basic stability; collector to base bias, self bias amplifiers. Stabilization against variations in VBE and β for the self bias circuit. Stabilization factors (S, S', S''). Bias compensation, thermistor and sensistor compensation, compensation against variation in VBE, Ico. Thermal runaway and Thermal stability.
FET: As voltage variable resistor and biasing.

Unit – III
Low frequency analysis of Transistor: Two port devices and the hybrid model, transistor hybrid model, determination of h-parameters from characteristics, measurement of h-parameters, conversion formulas for the parameters of three transistor configurations, analysis of transistor amplifier circuits using h- parameters, comparison of transistor amplifier configurations.
FET: Small signal model and analysis.

Unit – IV

Single stage Amplifiers: Simplified common emitter hybrid model, simplified calculations for common collector configuration and common base amplifier, common emitter amplifier with emitter resistance, Emitter follower, Miller's theorem and dual of Miller's theorem.
FET: Common source and common drain amplifiers.

Unit – V

High frequency Analysis: Hybrid- π common emitter transistor model, hybrid π conductance, hybrid π capacitance, validity of hybrid π model, variation of hybrid parameters, CE short circuit gain, current gain with resistive load, single stage CE transistor amplifier response, gain bandwidth product, Emitter follower at high frequencies.
FET: Common source and common drain amplifiers.

Text Books:

1. Integrated Electronics – J. Millman and C.C. Halkias, Mc Graw-Hill, 1972.
2. Electronic Devices and Circuits – Salivahanan, N.Suresh Kumar, A. Vallavaraj, Tata McGraw Hill, 2/e.

Reference Books:

1. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 2006, 9/e.
2. Micro Electronic Circuits – Sedra A.S. and K.C. Smith, Oxford University Press, 5/e.

SWITCHING THEORY AND LOGIC DESIGN

Subject Code: 13EC2003 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To solve a typical number base conversions
- To discuss various logic gates, Boolean functions to minimize the various logic functions
- To know minimization of logic functions
- To develop the various combinational circuits.
- To develop the sequential circuits

Course Outcomes:

At the end of the course the student will be able to:

CO1: Classify different number systems and apply to generate various codes

CO2: Summarize various logic gates, Boolean functions and realize Multi level logic functions.

CO3: Use the concept of Boolean algebra in minimization of switching functions

CO4: Design different types of Combinational logic circuits

CO5: Apply knowledge of flip-flops in designing of Registers and Counters

UNIT I: Review of Number systems:

Number systems Base conversion methods, complements of numbers, r's, r-1's compliment subtraction.BCD, Excess-3, Alphanumeric code, self complement codes, 2421, gray code, error detection & correction codes, Parity checking codes, Hamming codes.

UNIT II: LOGIC OPERATIONS:

Logic Gates, Boolean theorems, complements and dual of logic expressions, standard SOP & standard POS. Minimization of logic functions using theorems. Multi level NAND – NAND, NOR-NOR Realizations.

UNIT III : MINIMIZATION OF SWITCHING FUNCTIONS:

Minimization of switching functions using K-Map up to 5-variables, code converters and binary multiplier using K-Map, Tabular minimization.

UNIT IV: COMBINATIONAL LOGIC CIRCUITS:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess3 adder circuit, look-a-head adder circuit.

Design of decoder, Encoder, multiplexer, de-multiplexer, priority encoder, comparator, BCD- seven segment display.

UNIT V: SEQUENTIAL LOGIC CIRCUITS:

Classification of sequential circuits, flip-flops with truth tables and excitation tables. Conversion of flip-flop to flip-flop.

Design of ripple counters, synchronous counters, Johnson counters, ring counters.

Design of Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

TEXTBOOKS:

1. Digital design by Mano 2nd edition PHI.
2. Fundamentals of Digital Circuits by Ananda Kumar, EEE Editiion.
3. Modern Digital Electronics by RP Jain, TMH.

Reference Books:

1. Switching and Finite automata theory, 2nd Edition, Zvi Kohavi, Tata Mcgraw – Hill, 1978.
2. Micro electronics by Millman MH edition.
3. Fundamentals of Logic Design by Charles H.Roth Jr, Jaico Publishers.

SIGNALS AND SYSTEMS

Subject Code: 13EC2004 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- Describe signals mathematically and perform mathematical operations on signals.
- Discuss the fundamental concepts in time and frequency domain representation.
- Classify signals and systems.
- Analyze the Fourier series and Fourier transform of a set of well-defined signals.
- Acquire knowledge on need of sampling, convolution and correlation concepts.
- Discuss the importance of Laplace transforms in solving differential equations and the concept of ROC.
- Outline the concept of Z- Transform

Course Outcomes:
At the end of the course the student will be able to:

CO1: Classify various types of signals and systems
CO2: Compute the Fourier series and Fourier transform of a set of well-defined continuous time signals.
CO3: Analyze the characteristics of Linear Time Invariant systems
CO4: Explain the need of sampling, convolution and correlation concepts.
CO5: Summarize the concepts of Laplace and Z transforms

UNIT – I
Signal Analysis: Introduction to signals and systems, classification of signals and systems, analogy between vectors and signals, orthogonal signal space, signal approximation using orthogonal functions, mean square error, closed or complete set of orthogonal functions, orthogonality in complex functions, exponential and sinusoidal signals, properties of elementary signals.

UNIT – II
Fourier Series: Representation of Fourier series, continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, trigonometric and exponential Fourier series, Complex Fourier spectrum.

Fourier Transform: Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signals and standard signals, properties of Fourier transforms, Fourier transform of periodic signals.

UNIT – III
Continuous Time LTI systems: Representation of continuous time signals in terms of impulses, Linear time variant and invariant systems, unit impulse response and the convolution integral representations of LTI system, transfer function of a LTI system. Filter

characteristics of linear systems. Distortion less transmission through a system, signal bandwidth, system bandwidth, ideal LPF, HPF and BPF characteristics, causality and Poly-Wiener criterion for physical realization.

UNIT – IV

Convolution and Correlation of Signals: Concept of convolution and correlation in time domain and frequency domain, cross correlation and auto correlation, energy and power density spectrum, properties of correlation and related problems.

Sampling of Signals: Sampling theorem, Impulse sampling, Natural and Flat top sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing.

UNIT – V

Laplace Transform: Review of Laplace transforms, Laplace Transforms of typical signals, properties of LT, relation between LT and FT of a signal. Region of convergence (ROC) and constraints on ROC. Inverse Laplace transforms.

Z – Transform: Introduction to Z - transform.

Text Books:

1. Signals, Systems and Communications – B.P. Lathi, BS Publications, 2003.
2. Signals and Systems – A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2/e.

Reference Books:

1. Signals & Systems – Simon Haykin and Van Veen,Wiley, 2/e.
2. Fundamentals of Signals and Systems – Michel J. Robert, MGH International Edition, 2008.

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Subject Code: 13EC2005 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To study the concept of random variables.
- To study the concept of probability distribution and probability density functions.
- To understand the overview of multiple random variables.
- To understand the basic theoretical concepts of random process.
- To understand the need of spectral analysis of a random process.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Recall the mathematical concepts related to probability theory.
CO2: Understand random variable and distribution functions.
CO3: Translate one variable random variable concept into multiple random variables.
CO4: Understand random process concept.
CO5: Discriminate the power spectrum estimation in time and frequency domain.

UNIT – I

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

UNIT – II

Operations on one random variable: Definition of random variable, expected value of random variable, function of random variable, monotonic and non – monotonic transformations of continuous random variable, conditions for a function to be a random variable. Classification and properties of random variables. Distribution and Density functions.

Examples of density functions: Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh function.

UNIT – III

Multiple random variable: Vector random variables, joint distribution function, properties of joint distribution, marginal distribution functions, conditional distribution and density – statistical independence, sum of two random variables, sum of several random variables, central limit theorem, equal and unequal distributions.

Operations on multiple random variables: Expected value of a function of random variables, joint moments about the origin, joint central moments, joint characteristic functions.

UNIT – IV

Joint Gaussian Random Variables: Two random variables case, N random variable case, properties, transformations of multiple random variables and linear transformations of Gaussian random variables.

Random process: The random process concept, concept of stationarity and statistical independence. First – order, second – order, wide – sense and strict – sense stationarity. Time average and Ergodicity and mean – Ergodic Processes. Autocorrelation and its properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT – V

Power Spectrum: Properties, relationship between power spectrum and autocorrelation function, cross – power density spectrum, properties, relationship between cross – power density spectrum and Cross – Correlation Function.

Linear Systems with Random Inputs: Random signal response of linear Systems (convolution, mean, mean – squared, autocorrelation and cross – correlation), spectral characteristics of system response (power density), band pass, band-limited and narrowband processes.

Modeling of noise sources: Resistive (thermal) noise structure, arbitrary noise sources, effective noise temperature, average noise figure and average noise figure of cascaded networks.

Text Books:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 2001, 4/e.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 2002, 4/e.

Reference Books:

1. Probability,Stastistics and Random Processes – K.Murugesan and P.Gurusamy, Anuradha Publications.
2. Probability Methods of Signal and System Analysis - George R. Cooper, Clave D. MC Gillem, Oxford, 1999, 3/e.

NETWORK ANALYSIS

Subject Code: 13EE2007 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To be aware of network elements and how to solve problems by using basic laws, mesh & nodal analysis.
- To know AC fundamentals to solve AC circuits and network topology to solve complex circuits easily.
- To gain knowledge about steady state analysis of ac circuits, complex circuits and importance resonance in electrical engineering.
- To understand the importance of network theorem in solving complicated circuits easily in less time.
- To be aware of two-port networks to solve problems in electrical and electronics engineering.
- To know the transient operation of electrical circuits such as RL, RC, RLC networks fed with DC & AC excitation.
- To be aware of different types of filters and their use.

Course Outcomes:

At the end of the course the student will be able to:

CO1: The students can be consultant for wiring of a multi-storied building.

CO2: The students will be able to add, subtract, multiply, divide complex electrical Quantities. They can analyze AC voltage waveform. They can have an idea to solve a complicated circuit easily.

CO3: They can know the steady state response of AC circuits, use of coupled circuit of transformer they can design resonant circuit for communication purpose.

CO4: They can solve various types of electrical and electronic circuits by using different network theorems. Students can solve electrical and electronic circuits by using two-Port parameters.

CO5: Students can know the transient behavior of DC and AC electrical circuits and can safeguard the circuits from transients. Pupils will be ware of different types of filters and their applications to eliminate harmonics from electrical circuits when non-linear loads are present

UNIT – I

Introduction to Electrical Circuits: Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources (Ideal, Non-ideal, Independent and dependent sources), Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problems (with resistances only including dependent sources).

UNIT – II

AC Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, angular velocity and frequency, RMS value, average value, Form factor and peak factor, phase angle, phasor representation, addition and subtraction of phasor and mathematical representation of sinusoidal quantities (explanation with relevant theory and problems). Principle of duality (with examples).

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

UNIT – III

Steady State Analysis of AC Circuits: Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits, complex impedance and phasor notation for R-L, R-C, R-L-C and Star-Delta conversion (explanation with relevant theory and problem solving using mesh and nodal analysis).

Coupled Circuits: Self inductance, mutual inductance, coefficient of coupling, analysis of coupled circuits, natural current, dot rule of coupled circuits, conductively coupled equivalent circuits (explanation with relevant theory and problems).

Resonance: Introduction, definition of Q, series resonance, bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, bandwidth of parallel resonance, general case- resistance present in both branches, anti resonance at all frequencies (explanation with relevant theory and problems).

UNIT – IV

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Maximum Power Transfer, Tellegens (explanation with relevant theory and problems using dependent and independent sources).

Two-port networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, relationship between parameter sets, parallel connection of two port networks, cascading of two port networks, series connection of two port networks (explanation with relevant theory and problems using dependent and independent sources)

UNIT – V

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

Filters: LPF, HPF, BPF, Band Elimination, All pass prototype filters design, M-derived filters of LP and HP filters only, Composite design of LP and HP filters.

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 2000, 3/e.
2. Electric Circuit Analysis – Hayt and Kimmarle, TMH.
3. Network Analysis and Filter Design – Chadha, Umesh Publications.

REFERENCE BOOKS:

1. Network lines and Fields – John. D. Ryder, Asia publishing house, 2/e.
2. Schaum's outlines of basic circuit analysis – John O' Malley, McGraw Hill, 2/e.
3. Network Analysis and Synthesis – Umesh Sinha, Satya Prakashan Pub., 1983, 3/e.

ELECTRICAL TECHNOLOGY

Subject Code: 13EE2008 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:
Understand different types of DC Machines–Construction, characteristics and testing when DC machine acts as generator and motor.

- Learn the construction and working principle of single phase transformers and its testing.
- Learn different types of induction motors and their speed-torque characteristics.
- Analyze different types of alternators and their principle of operation also should learn the method of calculating the voltage regulation by synchronous impedance method.
- Learn about different types of measuring instruments, their construction and applications.

Course Outcomes:
At the end of the course the student will be able to:

CO1: Student can able to identify the constructional parts and their purposes in DC machine.

CO2: Student can able to predetermine efficiency and regulation of a single phase transformer by O.C and S.C test

CO3: Student can able to understand the types of induction motors and methods of starting of induction motors.

CO4: Students should be able to distinguish types of alternators and their applications and able to calculate the voltage regulation by synchronous impedance method.

CO5: Apply the various measuring instruments based on supply and also gains knowledge for range extension of meters.

UNIT – I
DC Generators: Principle of operation of DC Machines – Construction, EMF equation – Types of generators –Characteristics of DC generators.

DC Motors: Types, Back EMF, Torque Equation, Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency of DC Machines – Swinburne's test – Brake test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

UNIT – II
Single Phase Transformers: Principle of operation of single phase transformer – types – Constructional features – EMF equation, Phasor diagram on No Load and Full load – equivalent circuit – losses and efficiency of transformer and regulation – OC and SC tests – predetermination of efficiency and regulation (Simple problems).

UNIT – III

Induction Motors: Introduction to single phase induction motors (principle of operation only) – three phase induction motors – construction and principle of operation of Slip ring and Squirrel cage motors – Slip-Torque characteristics – efficiency calculation – starting methods.

UNIT – IV

Alternators: Alternators – constructional features – principle of operation – types – EMF Equation – distribution and coil span factors – predetermination of regulation by synchronous impedance method – OC and SC tests.

UNIT – V

Electrical Instruments: Basic principles and essentials of indicating instruments – essentials of indicating instruments – types – permanent magnet moving coil – extension range of instruments – moving iron instruments (Ammeters and Voltmeters).

TEXT BOOKS:

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering – T.K. Nagasarkar and M.S.Sukhija, Oxford University Press.

REFERENCE BOOKS:

1. Basic Electrical Engineering – K.B. Madhusahu, Scitech Publications.
2. Theory and Problems of basic electrical engineering – I.J. Nagarath and D.P Kothari, PHI Publications.

ELECTRONIC DEVICES AND CIRCUITS LAB

Subject Code: 13EC2102 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

- To measure the Frequency of a waveform using CRO.
- To observe experimentally the V-I characteristics of PN junction semiconductor diode, Zener diode and photo diode.
- To observe experimentally the V-I characteristics of bipolar junction Transistor in CB, CE and CC configurations.
- To verify practically, the response of diode rectifiers with and without filters.
- To observe experimentally the V-I characteristics of FET,SCR and UJT

Course Outcomes:

At the end of the course the student will be able to:
CO1: Determine the frequency using CRO
CO2: Draw the characteristics of PN, Zener diodes
CO3: Explain the characteristics of Transistors in CE, CB configuration.
CO4: Illustrate the response of HWR, FWR.
CO5: Compute the VI characteristics of SCR, UJT, FET.

List of Experiments (At least ten experiments are to be done) :

1. Frequency measurement using CRO.
2. PN Junction diode characteristics A. Forward bias B. Reverse bias.(cut-in voltage & Resistance calculations)
3. Zener diode characteristics and Zener as a regulator
4. Photo diode characteristics
5. Transistor CB characteristics (Input and Output) & h Parameter calculations
6. Transistor CE characteristics (Input and Output) & h Parameter calculations
7. Transistor CC characteristics (Input and Output) & h Parameter calculations
8. Rectifier without filters (Full wave & Half wave)
9. Rectifier with filters (Full wave & Half wave)
10. JFET characteristics
11. SCR characteristics
12. UJT characteristics

NETWORKS AND ELECTRICAL TECHNOLOGY LAB

Subject Code: 13EE2107 **External Marks: 50**
Credits: 2 **InternalMarks: 25**

Course Objectives:

- Student will learn how to apply theorems for a given network.
- Student will know 2-port network, how to calculate Z & Y parameters for a simple 2-port T-Network.
- Student will learn about resonance, design of series and parallel. Impact of Quality factor on Bandwidth.
- Student will know how to perform brake test on DC shunt motor & 3-Phase Induction motor, draw its characteristics

Course Outcomes:

At the end of the course the student will be able to:
CO1: The Student should gains knowledge on application of theorems.
CO2: Student Able to calculate Z & Y-parameters for a given 2-Port network.
CO3: Student gains knowledge on resonance, designs series and parallel circuit. Effect of Q-factor on Bandwidth for series resonant circuit.
CO4: Student can analyze the performance of DC machines.
CO5: Student can Analyze the performance of AC machines.

List of Experiments (Atleast five experiments are to be done from each part) :

PART – A

a. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
b. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
c. Two port network parameters Z-Y Parameters
d. Verification of Superposition and Reciprocity theorems.
e. Verification of Maximum Power transfer theorem.
f. Verification of Thevenin's and Norton's theorems.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance & critical speed.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Brake test on 3-phase Induction motor (performance characteristics).
6. Regulation of alternator by synchronous impedance method.

ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

(Common for all Branches)

Subject Code: 13HS2102 **Internal Marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives:

- Aware to different kinds of Learner-friendly approaches of language to an array of self-instructional learning (Computer based).
- Achieving reasonably good level of competency in Group Discussions, Presentations and Public speaking.
- Facilitating in how to face interviews.
- Providing a wide range of vocabulary to perform better in International tests like GRE, TOEFL, and IELTS etc.
- Gathering ideas and organize them relevantly and coherently.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Students will be able to recognize and compare various socio-cultural and professional contexts appropriately.

CO2: Students will be able to evaluate their own performance participating well in GDs and other language-related activities.

CO3: Students will be able to experiment language more effectively and carry out various competitive examinations well.

CO4: Students will be able to compose the ideas relevantly and coherently.

CO5: Students will be able to discuss and report various situations efficiently

List of Sessions

UNIT I: Vocabulary Development
UNIT II: Reading Comprehension
UNIT III: Presentation Skills
UNIT IV: Group Discussions
UNIT V: Resume Writing & Interview Skills

TEXT BOOKS:

- "Speak Well" by K. Nirupa Rani, Jayashree Mohan Raj, B. Indira, Orient Blackswan, Hyderabad (2012)
- "Strengthen your Steps" by Dr. M. Hari Prasad, Dr. John Varghese, Dr. R. Kishore Kumar, Maruthi Publications, Hyderabad (2010)

REFERENCE BOOKS

- A Text Book of English Phonetics: For Indian Students by T. Balasubramanian, Macmillan Publishers India (2000)
- How to Prepare for Verbal Ability and Reading Comprehension for CAT by Arun Sharma

PROFESSIONAL ETHICS & MORALS

Subject Code: 13HS2201 **Internal Marks: --**
Credits: -- **External Marks: --**

Course Objectives:

- To understand the necessity of value system and its application.
- To understand the process of thinking and its impact on attitude, behavior and psychology.
- To understand the process of decision making taking into consideration safety and risk.
- To understand the impact of corruption on economy and society.
- To understand moral issues related to occurrence of events in real world.

Course Outcomes:

CO1: Learn how to apply values where necessity arises.
CO2: Learn how to regulate their behavior.
CO3: Learn the art of decision making and implementation.
CO4: Learn to plug loopholes and induce transparency in work
CO5: Learn how through diligence disasters can be avoided.

UNIT I:

Introduction to Values and Morals: Theory of Evolution – Ethics as a necessity for piritual evolution-- Description of Human Values & Morals ---- Values --- Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others, 7 Ways of Misusing Truth -- Work Culture, Social Responsibility, Responsibilities as a Citizen, Cooperation and Commitment, Caring and Sharing--- Religion vs. Spirituality, Philosophy, Customs and Practices --- Impediments to Responsibility – Self-Interest, Fear, Self-Deception, Ignorance, Ego, Narrow Vision, Uncritical Acceptance of Authority, Group Thinking.

UNIT II:

Mind and Its Mysteries: What is Mind? Mind and Body, Mind and Food--- Mental faculties, Theory of perception, Memory, Tendencies, Thought Creates the World -- Power of Thought, Thought-Culture, Desires, Pleasure and Pain -- Cultivation of Virtues, Control of Senses and Mind -- Discrimination, Dispassion, Sacrifice – Concentration, Meditation and Enlightenment.

UNIT III:

Risk, Safety and Environment: Difficulties in Estimating Risk -- Approach to Acceptable Risk, Regulator's Approach to Risk – Engineer's Liability, Changing Legal Rights of Employees -- Organizational Disobedience by Contrary Action, Non-Participation, Protest -- Environmental Laws and Judicial Intervention in Related Matters -- Environmental Movements.

UNIT IV:

Non-Ethical Practices in Vogue: Engineer's Responsibility for Rights - Respect for Authority – Conflict of Interest- Occupational crime -- Global Issues – How Multinational Corporations Influence Government Decisions, Risk and Public Policy --- Engineers as Managers, Advisors and Experts, Engineers as Moral Leaders --- Problem of Bribery, Extortion, Grease Payments, Nepotism ----Nexus between Politician and Industrialist ---- Case Study – Chinese Minister Sentenced to Death for Corruption.

UNIT V:

Case Studies – Variety of Moral Issues in Profession:

Chernobyl nuclear disaster, Air bags, Cadillac Chips, Nuclear Power Generation Plant, Highway Safety, Microwaves, Renewable Energy, Training Fire Fighters.

TEXT BOOKS:

1. Charles E Harris, Micheal J Rabins, "Engineering Ethics, Cengage Learning
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw Hill

REFERENCE BOOKS:

1 Mind, Its Mysteries and Control, Swami Sivananda, Divine Life Society Pub.

ELECTRONIC CIRCUITS – 2

Subject Code: 13EC2008 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Introduce concepts in Cascading in BJT and FET amplifier
- Identify different types of feedback amplifiers
- apply the concept of feed back to the Oscillators
- Understand the design concept of power amplifier
- Know the concepts of tuned amplifiers and voltage regulators.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Extrapolate BJT and FET amplifier used for cascading stages.
CO2: Point out different types of feedback amplifiers.
CO3: Examine the application of positive feedback amplifier as an oscillator.
CO4: Differentiate BJT and FET amplifier as a power amplifier for high voltage applications.
CO5: Interpret the concepts of tuned amplifiers and regulators..

UNIT – I

Multistage Amplifiers: Cascading transistor amplifiers, choice of transistor configuration in cascade amplifier, high input resistance transistor circuits, Darlington pair, cascade amplifier, cascode frequency response and analysis of RC coupling, direct coupling and transformer coupling, difference amplifier, two stage RC coupled, JFET amplifiers (in common source (CS) configuration).

UNIT – II

Feedback Amplifiers: Classification of Amplifiers, Feedback concept, Transfer Gain with feedback, General characteristics of negative feedback amplifiers, Effect of Feedback on input and output Resistances, Method of Analysis of Feedback Amplifiers, Voltage series, voltage shunt, current series, and current shunt feedback amplifiers with discrete components and their analysis.

UNIT – III

Oscillators: Condition for oscillations. RC-phase shift oscillators (using BJT and JFET) (including derivation for frequency of oscillation), Wien bridge oscillator, LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillators.

UNIT – IV

Power Amplifiers: Class A large signal Amplifiers, Second harmonic Distortions, Higher order harmonic Distortion, Transformer Coupled Audio power amplifier, Push-pull amplifiers, Class B Amplifiers, Class AB operation, Complementary Symmetry push pull amplifier, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink.

UNIT – V

Tuned Amplifiers: Single tuned and staggered tuned amplifiers – analysis, Double Tuned Amplifiers- Band width calculation.

Voltage Regulators: Voltage regulation – Line Regulation, Load Regulation, Types of Regulators, Series voltage regulator , shunt regulators, Overload Voltage protection.

Text Books:

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

Reference Books:

1. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 2006, 9/e.
2. Micro Electronic Circuits – Sedra A.S. and K.C. Smith, Oxford University Press, 5/e.

ANALOG COMMUNICATIONS

Subject Code: 13EC2009 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Discuss the basic elements of a communication system and amplitude modulation.
- Explain the representation, generation and demodulation of various forms of amplitude modulation.
- Describe the concepts, generation and detection of frequency and phase modulation schemes.
- Describe various issues in radio transmitters and receivers
- Explain pulse modulation schemes and compare various analog modulation schemes w.r.t noise

Course Outcomes:

At the end of the course the student will be able to:

CO1: Explain the basic elements of communication system, need for modulation and elaborately about amplitude modulation.

CO2: Describe the time and frequency domain representation, generation and demodulation of DSBSC, SSB and VSB modulation schemes.

CO3: Discuss the concepts of angle modulation.

CO4: Explain various issues in radio transmitters and receivers

CO5: Describe pulse modulation schemes and estimate the noise in analog modulation schemes

UNIT – I

Introduction: Introduction to communication system, need for modulation, classification of modulations.

Amplitude Modulation: Time domain and frequency domain description; Single tone and multi tone AM modulation; Power and current relations in AM wave; Generation of AM Waves – Square Law Modulator, Switching Modulator. Detection of AM wave: Square Law Detector, Envelope Detector.

UNIT – II

DSBSC Modulation: Time domain and frequency domain description, Generation of DSBSC Wave - Balanced Modulators, Ring Modulator. Coherent detection of DSBSC Modulated wave, COSTAS Loop.

SSB Modulation: Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated wave, Time domain description, Phase discrimination method for generating AM SSB Modulated wave. Demodulation of SSB wave, VSB Modulation, Comparison of AM Techniques, Applications of different AM Systems.

UNIT – III

Angle Modulation: Basic concepts, Single tone frequency modulation, Single tone phase modulation, Spectral Analysis of Sinusoidal FM and PM signals, Differences between FM and

PM signals, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM and PM Signals - Direct and indirect methods. Detection of FM wave - Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.
Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Comparison between TDM and FDM.

UNIT – IV
Radio Transmitters: Classification of Transmitters, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.
Radio Receivers: Classification of Receivers - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, Communication Receiver, FM Receiver, Comparison between FM receiver AM Receiver, Amplitude limiting.

UNIT – V
Pulse Modulation: Types of Pulse modulation, PAM (Single polarity, double polarity) Generation & demodulation of PAM; Generation & demodulation of PWM; Generation and demodulation of PPM.
Noise in analog modulation: Signal-to-Noise ratios, AM receiver model, SNR for coherent reception, noise in AM receivers using envelope detection, FM receiver model, FM Threshold effect, Pre-emphasis & de-emphasis.

Text Books:

1. An Introduction to Analog and Digital Communications - Simon Haykin, John Wiley, 2/e.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004.

Reference Books:

1. Communication Systems – B.P. Lathi, BS Publication, 2006.
2. Principles of Communication Systems – H Taub and D. Schilling, TMH, 2007, 3/e.

PULSE AND DIGITAL CIRCUITS

Subject Code: 13EC2010 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To introduce Wave shaping concepts of both linear and non linear circuits
- To study about switching characteristics of devices
- To study about the analysis and designing of multivibrators
- To Know the basic operating principles of sampling gates and their applications
- To learn about the time base generators and blocking oscillators

Course Outcomes:

At the end of the course the student will be able to:

CO1: Construct different linear networks like low pass and high pass circuits and determine their response to different signals

CO2: Determine the transfer characteristics of clippers and clamper circuits

CO3: Determine the switching characteristics of semiconductor devices and analysis of binary

CO4: Design of multivibrators and analysis of time base generators

CO5: Analysis of blocking oscillators and sampling gates

UNIT – I

Linear wave shaping: High pass, low pass RC circuits; response of high pass and low pass RC circuit for sinusoidal, step, pulse, square and ramp inputs; RC circuit as differentiator, integrator and attenuator; RL and RLC circuits and their response for step input; Ringing circuit.

UNIT – II

Non – Linear Wave Shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT – III

Switching Characteristics of Devices: Diode and transistor as switches, break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times, Junction switching time.

Bistable Multivibrators: Analysis and design of Bistable Multivibrators; Fixed bias and self biased transistor binary circuits, commutating capacitors, triggering in binary, Schmitt trigger, applications.

UNIT – IV

Monostable and Astable Multivibrators: Analysis and design of monostable multivibrator, collector-coupled and emitter-coupled monostable multivibrators, triggering in monostable multivibrator. Analysis and design of astable multivibrator (collector coupled and emitter-coupled) using transistors.

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.

UNIT – V

Blocking Oscillators:

Monostable blocking oscillator (Base timing and emitter timing), Astable blocking oscillator (diode controlled and RC controlled applications)

Sampling Gates:

Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, reduction of pedestal in Gate circuits, four diode sampling gates, Applications sampling gates

Text Books:

1. Pulse, Digital and Switching Waveforms – J. Millman and H. Taub, McGraw-Hill, 1991.
2. Pulse and Digital Circuits – Venkata Rao K., Ramasuda K., Manmadharao G., Pearson Education, 2010.

Reference Books:

1. Digital Logic State Machine Design – David J.Comer, Oxford University Press, 2008, 3/e.
2. Pulse and Digital Circuits – MS Prakash Rao, Tata McGrawHill.

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Subject Code: 13EC2011 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To apply differential equations, vector algebra, integral multivariate calculus and complex calculus to solve for basic electrostatic, magneto static and electromagnetic field problems.
- To analyze the interaction of electromagnetic fields in different media.
- To describe the propagation of plane electromagnetic waves in lossless and lossy media.
- To solve for the reflection and transmission of uniform plane waves at planar interfaces .
- To learn overall concepts of Transmission line theory.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Apply differential equations, vector algebra, integral multivariate calculus and complex calculus to solve for basic electrostatic field problems.
CO2: Analyze magneto static field concepts.
CO3: Describe electromagnetic fields using Maxwell's relations
CO4: Solve the reflection and transmission of uniform plane waves at planar interfaces.
CO5: Learn about Transmission line theory

UNIT – I

Review of Coordinate Systems, Vector Calculus

Electrostatics: Coulomb's Law, Electric Field Intensity, Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Related Problems. 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, Related Problems.

UNIT – II

Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy.

UNIT – III

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces. Related Problems.

UNIT – IV

EM Wave Characteristics: 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. Related Problems.
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. Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor. Related Problems.

UNIT – V
Transmission Lines: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading. Related Problems. Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations. Smith Chart – Configuration and applications, Single and double stub matching. Related Problems.

Text Books:
1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 2001, 3/e.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2000, 2/e.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2001.

Reference Books:
1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 2006, 7/e.
2. Schaums Outline Series – Electromagnetics – Joseph A Edminister, Tata Mcgraw Hill, 3/e.

LINEAR CONTROL SYSTEMS

Subject Code: 13EE2013 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To describe the feedback controls with basic components of control systems.
- To formulate mathematical models of physical systems and block diagram representation.
- To analyze stability of the system from transfer function approach.
- To describe and analyze various time domain and frequency domain tools for analysis and design of linear control systems.
- To represent physical systems in state space form and analyze them.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Estimate basic components of feedback control systems; formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs.
CO2: Discuss the time-domain specifications; Analyze first and second order control systems in time domain.
CO3: Analyze stability of the system from transfer functions approach and graphical methods.
CO4: Design controllers, compensators and control system.
CO5: Solve physical systems in state space form.

UNIT – I

Concepts of Control Systems: Open loop and closed loop control systems- examples- Classification of control systems- Feedback characteristics- Effects of feedback characteristic.
Mathematical models of physical systems: Differential equations- transfer functions and block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by signal flow graph - Reduction using Mason's gain formula - Translational and rotational mechanical systems.

UNIT – II

Transfer function of elements of control systems: Transfer function of DC Servo motor - AC Servo motor- Synchro transmitter and receiver.
Time Response analysis: Standard test signals - Time response of first order systems – Characteristic equation of feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Concept of stability: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability.
Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s), H(s) on the root loci.

UNIT – IV

Frequency response analysis: Introduction, Frequency domain specifications – Bode diagrams – Determination of frequency domain specifications and transfer function from the Bode Diagram – Phase margin and Gain margin – Stability analysis from Bode plots.
Polar plots – Nyquist plots- Stability analysis.

UNIT – V

Design and Compensation techniques: Introduction and preliminary design considerations – Lag, Lead, Lead – Lag compensation based on frequency response approach.
State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, diagonalization – solving the time invariant state equations – State transition matrix, Concepts of Controllability and Observability.

Text Books:

1. Automatic Control Systems – B. C. Kuo, John Wiley, 2003, 8/e.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International limited Publishers, 2/e.
3. Modern Control Engineering – Kotsuhiko Ogata, Prentice Hall of India pvt ltd, 5/e.

Reference Books:

1. Control Systems – A.Anand Kumar, PHI Publications,4/e.
2. Control Systems Engineering – S.Palani,Tata Mc Graw Hill Publications.

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PULSE AND DIGITAL CIRCUITS LAB

Subject Code: 13EC2103 **External Marks: 50**
Credits:2 **Internal Marks: 25**

Course Objectives:

- Design of low pass and high pass filter for different time constants
- Examine the operation of clippers and clampers
- Analysis of logic gates and sampling gates
- Generation of different types of waveforms using transistor circuits
- Evaluation of UTP and LTP using Schmitt Trigger
- Design of switch using transistor

Course Outcomes:

At the end of the course the student will be able to:
CO1: Design linear and non linear wave shaping circuits
CO2: Demonstrate the operation of logic gates and sampling gates
CO3: Analyze multivibrators and its applications
CO4: Generate Oscillations and sweep signals using UJT and Boot strap circuits
CO5: Test and explain the operation of Transistor as a switch

List of Experiments (At least ten experiments are to be done) :

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Logic Gates using discrete components.
6. Sampling Gates.
7. Astable Multivibrator.
8. Monostable Multivibrator.
9. Bistable Multivibrator.
10. Schmitt Trigger.
11. UJT Relaxation Oscillator.
12. Bootstrap sweep circuit.

ANALOG COMMUNICATIONS LAB

Subject Code: 13EC2105 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

To make the students exposed on

- various analog modulation and demodulation schemes
- Verify sampling theorem
- Analyze various modulated schemes by using spectrum analyzer
- various associated circuits of analog modulation schemes

Course Outcomes:

At the end of the course the student will be able to:
CO1: Integrate and test AM and FM modulators and demodulators
CO2: Illustrate sampling theorem in different conditions
CO3: Analyze AM and FM signals using Spectrum analyzer
CO4: Test associated circuits such as AGC, pre-emphasis and de-emphasis
CO5: Integrate and test various pulse modulation and demodulation schemes
CO6: Estimate lock range and capture range of PLL

List of Experiments (At least ten experiments are to be done) :

1. AM – Modulation and Demodulation.
2. AM - DSB SC - Modulation and Demodulation.
3. FM - Modulation and Demodulation.
4. Spectrum Analysis of Modulated signal using Spectrum Analyser
5. Diode Detector
6. Pre-emphasis & De-emphasis
7. AGC Circuits
8. PLL & FM Demodulation using PLL.
9. Sampling Theorem
10. PAM - Modulation and Demodulation.
11. PWM - Modulation and Demodulation.
12. PPM - Modulation and Demodulation.

ELECTRONIC CIRCUITS ANALYSIS LAB

Subject Code: 13EC2106 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

- To design a common emitter, common collector amplifiers and analyze the frequency response in both hardware and software
- To design the feedback amplifiers and calculate various parameters such as input impedance output impedance
- To design oscillators using transistors for different frequencies
- To design power and single tuned amplifiers
- To design series and shunt voltage regulators

Course Outcomes:

At the end of the course the student will be able to:

CO1: Demonstrate the working of common emitter, common collector amplifier circuits and calculate the system bandwidth through frequency response
CO2: Apply the concept of feedback to analyze feedback amplifiers.
CO3: Design oscillators using transistors for different frequencies
CO4: Design class A, class B power amplifiers and single tuned amplifiers
CO5: Evaluate voltage regulation of series and shunt voltage regulators

Design and Simulation in Simulation Laboratory using Multisim OR Pspice OR Equivalent Simulation Software & verifying the result by Hardware (Atleast eight experiments are to be done):

1. Common Emitter - Frequency response, Impedances measurement (with
2. Common collector amplifier - Frequency response, Impedances measurement
3. Two Stage RC Coupled Amplifier
4. Current shunt and Voltage shunt Feedback Amplifier- Frequency response, Impedances measurement (with and without feedback)
5. Wien Bridge Oscillator using Transistors- Design for different frequencies
6. RC Phase Shift Oscillator using Transistors - Design for different frequencies
7. Class A Power Amplifier (with and without transformer load)
8. Class B Power Amplifier
9. Single Tuned Voltage Amplifier
10. Series Voltage Regulator
11. Shunt Voltage Regulator

SELF STUDY COURSE – I

Subject Code: 13EC2201 **External Marks: 0**
Credits: 1 **Internal Marks: 75**

- Self study course – I (4 periods per week) includes e – learning, internet learning and presentation skills.
- Out of 75 marks, 25 marks for day – to – day evaluation (self study report (10 marks) and seminar (15 marks) given by the student) and 50 marks on the basis of end examination conducted by internal (department) committee.
- At the end of semester the student is requires to submit a self study report and to write an objective examination (50 multiple choice questions – 50 X 1 = 50 marks) pertaining to any one of the following fields:

1) NETWORK SYNTHESIS:

Elements of realizability: Realizability of one port, Hurwitz polynomials, Positive real functions, Properties and applications of PRF, Necessary and sufficient conditions of PRF.
Driving point Synthesis: Synthesis of RC, RL, RLC networks, Brune's and Bott – Duffin method of synthesis.
Two – port Synthesis: LC and RC ladder development, Darlington and Guillemin method of synthesis.
Synthesis of Lattice and Constant resistive networks: Synthesis of loaded and unloaded lattice networks, Synthesis of constant resistance bridged T and Ladder networks.

2) CLASSICAL CONTROL SYSTEMS:

Modern Systems theory: An introduction to linear systems theory, state variables, state space description of dynamic systems, an analysis of continuous – time and discrete – time linear systems, controllability and observability of linear systems, stability theory, control system applications to mechanical and electromechanical systems.
Digital Control systems: Analysis and design of digital control systems, discrete linear systems, frequency domain and state variable techniques.
Nonlinear control systems: Input – output stability and absolute stability, strong positive real transfer functions, feedback linearization of nonlinear systems, nonlinear canonical forms, nonlinear decoupling, and sliding control.

3) ELECTRONIC SYSTEMS:

Analog building block circuits used in system design including operational amplifiers, voltage regulators, power amplifiers, video amplifiers, oscillators, modulators, phase detectors, phase – locked loops, multipliers, active filters, A/D and D/A converters.

4) ROBOTICS – I:

Iintroduction to Robotics: RIA definition - History of Robotics - Justification - Anatomy - Classification - Applications, Configurations of Manipulator - Cartesian - Cylindrical - Polar - Joint arm, Work Volume, Spatial resolution - Accuracy and Repeatability of Robotics.
Components of Robotics: Linckged and Joints of manipulators, drive systems, feed back devices, Degrees of freedom, end effectors - grippers, wrist configurations, motion - roll -

Pitch - Yaw, sensors - sensor areas for robots - contact and non contact sensors - Machine vision – introduction - An overview of manipulation tasks and automation requirements - Arm and hand kinematics; path, velocity and force control.

5) COMPLEX VARIABLES:

Analytic Functions and Integrations: Functions of a complex variable-Continuity-Differntiability-analyticity-Properties-Cauchy-Reimann equations in Cartesian and polar coordinates (without proof).Harmonic and conjugate harmonic functions-Milne-Thompson method. Cauchy's integral theorem-Cauchy's integral formula-Generalized Cauchy's integral formula.

Integration using Residues: Singular point-isolated singular point-pole of order m- essential singularity. Residue- Evaluation of residue by formula and by Laurent series-Residue theorem. Evaluations of integrals of the type (a) Improper real integrals (b) Integrals by indentation.

Conformal Mapping: Transformation by e^z , Inz, z^2, z^n (n is positive integer), Sinz, Cosz, z+a/z. Translation, rotation, inversion and bilinear transformation-fixed point-cross ratio-properties-invariance of circles and cross ratio-determination of bilinear transformation mapping 3 given points.

6) INDUSTRIAL ELECTRONICS – I:

Semiconductor Power Devices: Basic characteristics & working of Power Diodes, Diac, SCR, Triac, Power Transistor, MOSFETs, IGBT, and GTO.

Rectifiers and Inverters: Working principles of single and three phase bridge rectifiers, Voltage and current source inverters.

Power Supplies: Oeration of choppers; step up, step down and reversible choppers. High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck – boost converter. Uninterruptible Power Supply.

LINEAR IC APPLICATIONS

Subject Code: 13EC3012 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To introduce the basic building blocks of linear integrated circuits.
- To study the characteristics of operational amplifiers.
- To study the linear and nonlinear applications of operational amplifiers
- To study the characteristics of active filters, ADC and DAC
- To introduce the theory and applications of 555 Timer ,IC-566,PLL and analog multipliers

Course Outcomes:

At the end of the course the student will be able to:
CO1: Analyze differential amplifiers based on voltage gain, input resistance and output resistance
CO2: Determine the characteristics and various parameters of op-amp
CO3: Design the circuits using op-amps for various applications.
CO4: Design Active filters and Summarize the Performance of the ADC and DAC
CO5: Describe Linear ICs like 555 Timer,IC-566, PLL, analog multipliers and modulators.

UNIT I
Integrated Circuits: Differential Amplifier- DC and AC analysis of dual input and balanced output configuration, properties of other differential amplifier configuration (dual Input unbalanced output, single ended input – balanced/unbalanced output), DC coupling and cascade differential amplifier stages, level translator.

UNIT II
Characteristics of OP–amps, Integrated circuits – types, Classification, Package types and temperature ranges, Op-amp block diagram, ideal and practical Op-amp specifications, DC and AC characteristics, 741 op-amp & its features, FET input Op-amps, Op-amp parameters and measurement, input and output offset voltages and currents, slew rates, CMRR, PSRR, drift, frequency compensation technique.

UNIT III
Linear applications of Op-amps: Inverting and non-inverting amplifier, integrator and differentiator, difference amplifier, instrumentation amplifier, AC amplifier, V to I, I to V converters, buffers.
Non–linear applications of Op–amps: Non-linear function generation, comparators, multivibrators, triangular and square wave generators, log and anti log amplifiers, precision rectifiers.

UNIT IV

Active Filters: Introduction, Butterworth filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

D to A and A to D converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC. Different types of ADCs: parallel comparator, counter type, successive approximation and dual slope ADCs. DAC and ADC Specifications.

Specifications of ADC 574, DAC 1408.

UNIT V

Timers and Phase Locked Loops: Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger.

PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, applications of PLL – frequency multiplication, frequency translation, AM, FM and FSK demodulators. Applications of VCO (566).

Analog Multipliers and Modulators: Four quadrant multiplier, balanced modulator, IC1496, applications of analog switches and multiplexers, sample and hold amplifiers.

Text books:

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2003, 2/e.
2. Op-Amps and Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

Reference books:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.
2. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.

DIGITAL IC APPLICATIONS

Subject Code: 13EC3013 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To explain the different logic families and their comparison.
- To explain the design considerations of different combinational circuits and sequential circuits.
- To know the analysis procedures for combinational circuits and sequential circuits.
- To design different programmable logic devices.
- To study the RAM and ROM internal architecture and their timing diagrams

Course Outcomes:

At the end of the course the student will be able to:
CO1: Identify and distinguish the behaviour of various logic families
CO2: Design and Analyse the different combinational circuits with relevant IC's for various applications.
CO3: Design and Analyse the different sequential circuits with relevant ICs for various applications
CO4: Design programmable logic devices with relevant digital ICs
CO5: Classify the various memory devices with their internal structures and timing

UNIT I
Logic Families: Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families. bipolar logic, diode Logic, transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, emitter coupled logic, comparison of logic families.

UNIT II
Combinational Logic Design – I: Design and analysis procedures of decoders, encoders, three state devices, multiplexers and de-multiplexers, EX-OR gates and parity circuits and comparators. Design considerations of the above combinational logic with relevant digital ICs.
VHDL modeling of decoders, encoders, multiplexers and comparators.

UNIT III
Combinational Logic Design – II: Design and analysis procedures of adders, subtractors, ALUs, barrel shifter, simple floating-point encoder, dual parity encoder, cascading comparators and combinational multipliers. Design considerations of the above combinational logic with relevant digital ICs.
VHDL modeling of adders, subtractors, barrel shifter and combinational multipliers.

UNIT IV

Sequential Logic Design: Latches and flip-flops, counters, shift registers, synchronous design methodology, impediments to synchronous design.

VHDL modeling of ripple counters, synchronous counters and shift registers.

UNIT V

PLDs: Introduction to PROM, RAM, PLA, PAL, CPLD, FPGA. Design considerations of PLDs with relevant digital ICs.

VHDL modeling of memories and PLDs.

Text books:

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 2005, 3/e.
2. Digital IC Applications – Atul P.Godse and Deepali A.Godse, Technical Publications, Pune, 2005.
3. VHDL Primer – J. Bhasker, PHI,3rd Edition.

Reference books:

1. Digital System Design Using VHDL – Charles H. Roth Jr., PWS Publications,1998.
2. Digital Logic and Computer Design by Morris Mano, Prentice Hall.

DIGITAL COMMUNICATIONS

Subject Code: 13EC3014 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To summarize the Basic Process of Digital communication system and digitization techniques.
- To demonstrate different digital modulation techniques and to compute probability errors associated with different digital modulation techniques using Matched filter.
- To outline the concept of Information theory and Source coding techniques, channel capacity and bandwidth- S/N trade off.
- To illustrate Linear block code techniques which will detect and correct the errors associated with received data.
- To learn Convolution code Encoding and Decoding Techniques.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Differentiate various digitization techniques to achieve minimum bandwidth requirement.
CO2: Summarize and analyze all digital modulation techniques and probability of error calculations.
CO3: Measure the digital information through mathematical modeling and utilize suitable source coding techniques based on requirements in digital system.
CO4: Learn various block codes encoding and decoding methods.
CO5: Design convolution code encoder and decoder and to know graphical approach.

UNIT I
Elements of digital communication system, Advantages of digital communication system.
Pulse Code Modulation: Sampling, quantization and coding, quantization error, Companding in PCM systems. Differential PCM systems (DPCM); Delta modulation and drawbacks; adaptive delta modulation, noise in PCM and DM systems.

UNIT II
Digital Modulation Techniques: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK and M-ary systems.
Data Transmission: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, QPSK and FSK.

UNIT III
Information Theory: Discrete messages, concept of amount of information and its properties. Average information, entropy and its properties. Information rate, mutual information and its properties. Source coding: Shannon's theorem, Shanon-Fano coding and Huffman coding. Efficiency calculations, channel capacity of discrete and analog channels, capacity of a Gaussian channel and bandwidth – S/N trade off.

UNIT IV

Linear Block Codes: Introduction, matrix description of linear block codes, error detection and error correction capabilities of linear block codes. Hamming codes.
Binary cyclic codes: Algebraic structure, encoding and syndrome calculation.

UNIT V

Convolution codes: Encoding of convolution codes: time domain approach, transform domain approach, graphical approach (state, tree and Trellis diagrams).
Decoding of convolution codes using Viterbi algorithm.

Text books:

1. Digital communications - Simon Haykin, John Wiley, 2005.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.

Reference books:

1. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003.
2. Digital Communications – John Proakis, TMH, 1983.

ANTENNAS AND WAVE PROPAGATION

Subject Code: 13EC3015 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Describe the basic parameters of the antenna
- Calculate the field components of linear antennas using Maxwell's equations
- Understand the different antenna arrays and their characteristics
- Explain the construction ,operation and design considerations of VHF, UHF and MW frequency antennas and their applications
- Identify the atmosphere and terrestrial effects on Radio Wave Propagation

Course Outcomes:

At the end of the course student will be able to:

CO1: Describe the basic parameters of antenna and use solutions of Maxwell's equations to calculate electromagnetic field component for liner antennas.
CO2: Illustrate the concepts of different antenna arrays and their characteristics.
CO3: Design the different types of antennas at LF, HF and VHF frequencies.
CO4: Design and analyze the different types of antennas at UHF and MW frequencies.
CO5: Identify the atmosphere and terrestrial effects on Radio Wave Propagation.

UNIT I

Antenna Fundamentals: Introduction, radiation mechanism, antenna parameters, retarded potentials, radiation from small electric dipole, quarter wave monopole and half wave dipole – current distributions. Fields and patterns of thin linear center-fed antennas of different lengths. Antenna theorems – applicability and proofs for equivalence of directional characteristics, loop antennas, short dipole, short magnetic dipole.

UNIT II

Antenna arrays: Two element arrays – different cases, principle of pattern multiplication, N – element uniform linear arrays: broadside and end fire arrays, EFA with increased directivity, derivation of their characteristics and comparison.
Concept of scanning arrays. Directivity relations (no derivations) and related problems.
Binomial arrays, effects of uniform and non uniform amplitude distributions and design relations.

UNIT III

Non – resonant Radiators: Introduction, travelling wave radiators: basic concepts, long wire antennas: field strength calculations and patterns, V-antennas, rhombic antennas and design relations, helical antennas: significance, geometry and basic properties.

UNIT IV

VHF, UHF and Microwave Antennas: Arrays with parasitic elements, Yagi - Uda array and folded dipole and their characteristics. Reflector antennas: flat sheet and corner reflectors. Parabolic reflectors: geometry, characteristics, types of feeds, off-set feeds and Cassegrainian feeds. Horn antennas: types and optimum horns. Lens antennas: geometry and features.

Antenna Measurements: Patterns required, set up, distance criterion, directivity and gain measurements (comparison, absolute and 3-antenna methods).

UNIT V

Wave Propagation: Ground wave propagation, wave tilt, flat and spherical earth considerations.

Sky Wave Propagation: Formation of ionosphere layers and their characteristics. Optimum frequency, LUHF, virtual height, ionosphere abnormalities and ionosphere absorption. Fundamental equation for free-space propagation and basic transmission loss calculations.

Space Wave Propagation: Mechanism, LOS and radio horizon. Tropospheric wave propagation – radius of curvature of path, effective earth's radius, M-curves and duct propagation, tropospheric scattering.

Text Books:

1. Antennas for all applications – John D. Kraus and Ronald J. Marhefka, TMH, 2003, 3/e.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2000, 2/e.

Reference Books:

1. Antenna Theory – C.A. Balanis, John Wiley & Sons, 2001, 2/e.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Subject Code: 13EC3047 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Study of performance characteristics of different electronic measuring instrument, its analysis and calibration techniques.
- Subject introduces Signal Generator and Wave Analyzers for analysis of EM spectrum.
- Deals about Oscilloscopes and internal circuitry for measurement of electronic parameters.
- Brief discussion about all AC bridges and Q-meters, design methods and its applications.
- This subject includes sensor and transducers for the measurement of non electrical parameters and its signal conditioning techniques using electronic circuitry

Course Outcomes:

At the end of the course the student will be able to:
CO1: Identify electronic instruments, their Characteristics and use, peculiar errors associated with the instruments and how to minimize such errors.
CO2: Describe various signal generators, wave analyzers for distortion measurements.
CO3: Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
CO4: Design the AC bridges for measurement of resistance, inductance, capacitance for Frequency changes and Q-meter applications.
CO5: Explain various types of transducers and their applications for measuring non- electrical parameters.

UNIT I
Performance characteristics of instruments: Static characteristics, accuracy, resolution, precision, expected value, error and sensitivity. Errors in measurement and dynamic characteristics: speed of response, fidelity, lag and dynamic error.
Voltmeters: Multirange, range extension, solid state and differential voltmeters.
Ammeters: Shunt and thermocouple type ammeter.
Ohmmeters: Series type, shunt type, multimeter for voltage, current and resistance measurements.
Digital multimeters: Block diagram and specifications.

UNIT II
Signal Generators: Fixed and variable, AF oscillators, standard and AF sine and square wave signal generators, function Generators, square pulse, random noise and sweep.
Wave Analyzers: Harmonic distortion analyzers, spectrum analyzers and digital Fourier analyzers.

UNIT III

Cathode Ray Oscilloscopes: CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, dual beam CRO, measurement of amplitude and frequency. Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO (active and passive), attenuator type,

UNIT IV

AC Bridges:

Measurement of inductance: Maxwell's bridge, Anderson bridge.Measurement of capacitance: Schearing bridge. Kelvin's bridge, Wheatstone bridge and Wien Bridge. Errors and precautions and related problems. Q – meter.

UNIT V

Active and passive transducers: Resistance, capacitance, inductance, strain gauges, LVDT, piezo electric transducers, resistance thermometers, thermocouples, thermistors and sensistors. Basic Hall Effect sensors.

Calibration and standards and data acquisition systems.

Text Books:

1. Electronic instrumentation – H.S.Kalsi, Tata McGraw Hill, 2004, 2/e.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 2002, 5/e.

Reference Books:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2003, 2/e.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2004, 2/e.

COMPUTER ORGANIZATION AND ARCHITECTURE

Subject Code: 13CS3008 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To conceptualize the basics of organizational and architectural issues of a digital computer.
- To discuss in detail the operation of the arithmetic unit including algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.
- To analyze processor performance improvement using parallel processing and multiprocessor

Course Outcomes:

At the end of the course the student will be able to:

CO1: Knowledge of basic structure of a digital computer and data representation.

CO2: Implementation of different arithmetic operation in binary, decimal number system and floating point representation.

CO3: Knowledge of instruction set, addressing mode, instruction format, processor organization, micro operation and arithmetic logic unit design.

CO4: Ability to understand different type of memory unit, input unit, output unit and knowledge of mode of data transfer technique.

CO5: Distinguish parallel processing and multiprocessor in computer system and knowledge of interconnection structure of multiprocessor.

UNIT I

Introduction: Fundamental concepts of design methodologies; basic organization of computer. Computer types, functional unit, basic operational concepts, bus structures, software, performance, multiprocessors and multi computers. Data representation: fixed point representation and floating point representation.

UNIT II

Computer Arithmetic: Addition and subtraction, multiplication algorithms, division algorithms, fixed and floating – point arithmetic operations. Decimal arithmetic unit and decimal arithmetic operations.

UNIT III

Register Organization, Machine Instruction set: Register transfer language. Register transfer bus and memory transfers, arithmetic micro-operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer registers, computer instructions: instruction cycle, addressing modes, instruction formats and processor organization.

UNIT IV

Memory System: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory and memory management hardware.

Input – Output Organization: Peripheral devices, input-output interface, asynchronous data transfer modes of transfer, priority interrupt, direct memory access, input – output processor (IOP) and serial communication.

UNIT V

Pipeline: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline and RISC pipeline.

Multi processors: Characteristics of multiprocessors, interconnection structures. Inter processor arbitration, communication and synchronization. Cache coherence.

Text Books:

1. Computer System Architecture – M.Moris Mano, PHI / Pearson, 3/e.
2. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions.

Reference Books:

1. Computer Organization – Car Hamacher, Zvonks Vranesic, Safwat Zaky, McGraw Hill, 5/e.
2. Computer Organization and Architecture – William Stallings, PHI/Pearson, 2006, 7/e.

DIGITAL COMMUNICATIONS LAB

Subject Code: 13EC3107 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

- Estimate the process of transmitting many signals through a single channel by Time Division Multiplexing (multiple time slots) and draw corresponding waveform**.**
- Know how different Digitizers convert analog signal into digital signal (Binary).
- Study different digital modulation methods and demodulation and to observe waveforms.
- Know Source encoder and decoder algorithm implementation.
- Illustrate the Linear Block Codes (Hamming and Cyclic) and Non Linear Block Codes (Convolution).

Course Outcomes:

At the end of the course the student will be able to

CO1: Describe the process of Time division Multiplexing.
CO2: Illustrate digital output by different digitization methods and to reproduce actual analog signal.
CO3: Draw plots of the Digital Modulation and Demodulation waveforms (ASK, FSK, PSK and DPSK).
CO4: Verify companding and source encoding techniques
CO5: Verify Linear Block Codes implementation..
CO6: Predict the outputs of Non Linear Block Codes (Convolution Code).

List of Experiments (At least ten experiments are to be done) :

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.
8. Companding
9. Source encoder and decoder
10. Linear block code – encoder and decoder
11. Binary cyclic code – encoder and decoder
12. Convolution code – encoder and decoder

IC APPLICATIONS LAB

Subject Code: 13EC3108 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

- Analyze and design various applications using Op-amp.
- Design and construct waveform generation circuits.
- Design timer, analog and digital circuits using op amps.
- Design Adder, subtractor and comparator circuits using op amps
- Design Integrator and Differentiator Circuits using IC 741.

Course Outcomes:

At the end of the course the student will be able to:

CO1: identify specifications and parameters of IC 741, IC 555, IC 565, IC 566, IC 1496 and design Op-amp circuits to verify various mathematical operations.
CO2: Calculate Cut-off frequencies of Active Filters using Op-amp.
CO3: Generate sine wave, Pulse wave and Square wave using op-amp and Timer circuits.
CO4: Convert Digital input into Analog output using Op-amp.
CO5: Produce constant and variable voltages using Regulators

List of Experiments (At least twelve experiments are to be done) :

1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and specifications.
2. OP AMP Applications – Adder, subtractor and comparator circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order & second order).
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMP.
8. 4 bit DAC using OP AMP.
9. IC 555 Timer – Monostable Operation Circuit.
10. IC 555 Timer – Astable Operation Circuit.
11. Schmitt Trigger Circuits – using IC 741 and IC 555.
12. IC 565 – PLL Applications.
13. IC 566 – VCO Applications.
14. Voltage Regulators – 723, 7805, 7809, 7912.

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Subject Code: 13HS3202 **External Marks : 0**
Credits: 0 **Internal Marks: 0**

Course Objectives:

- **Core concepts:** Students will have a basic competence in the core concepts of each of the forms of intellectual property (Patents, Copyright and Related Rights, Trademarks, Industrial Designs and Integrated Circuits, Geographical Indications, Protections Against Unfair Competitions, and Traditional Knowledge), including the nature and extent of the rights that are available to protect them.
- **Applying disciplinary contexts:** Students will be familiar with all the important doctrines of the field of laws and treaties governing intellectual property, and will have a good understanding of the most important standards for registering, obtaining, and enforcing intellectual property rights at national, regional, and international levels.
- **Connections:** Students will begin to see the connections between intellectual property rights protection and development of world economy. In addition, students will understand how intellectual property rights make it possible for the creators of innovations to establish themselves more readily.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Understand the scope of intellectual property rights.
CO2: Understand the reasons behind the existence of intellectual property law.
CO3: Understand the process of the historical development of intellectual property rights.
CO4: Understand the distinct contribution of intellectual property law to the protection of human creativity, innovation, and effort.

UNIT I
Introduction to Intellectual Property Law – The Evolutionary Past – The IPR Tool Kit- Para - Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right.

UNIT II
Introduction to Trade mark – Trade mark Registration Process – Post registration procedures – Trade mark maintenance - Transfer of Rights - Inter parts.

Unit III
Intellectual Property Law Basics – Types of Intellectual Property – Agencies responsible for Intellectual Property Registration - Cyber crime and E-commerce – International Aspects of Computer and Online Crime.

Unit IV

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent requirements - Ownership - Transfer - Patents Application Process – Patent Infringement - Patent Litigation.

Unit V

International Patent Law – Double Patenting – Patent Searching – Patent Law Treaty - New developments in Patent Law – Invention Developers and Promoters.

Text Books:

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
4. Prabhuddha Ganguli: 'Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.

MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCES

Subject Code: 13HS3005 **External Marks: 70**
Credits: 2 **Internal Marks: 30**

Course Objectives:

- To apply managerial economics skills to the solution of engineering problems
- To apply the cost and production theories in engineering problems.
- To inculcate and develop the Management qualities.
- To improve the problem solving skills in various business areas.
- To forecast the future threats and application of theories.

Course Outcomes

At the end of the course the student will be able to:
CO1: Recognize managerial economics skills to the solution of engineering problems.
CO2: Explain the cost and production theories in engineering problems.
CO3: Explore and develop the management qualities.
CO4: Enhance the problem solving skills in various business areas.
CO5: Evaluate the future threats and application theories.

UNIT I
Introduction to Managerial Economics: Definition, Nature and Scope Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Elasticity of Demand, Types, Measurement and Significance of Elasticity of Demand, Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting viz. survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting.

UNIT II
Theory of Production and Cost Analysis: Production function in Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Production function, Laws of Returns, Internal and External Economies of Scale.
Cost Analysis: Cost concepts, Opportunity cost, Fixed & Variable costs, explicit costs & Implicit costs, Out of pocket costs & Imputed costs, Break-even Analysis (BEA), Determination of Break-Even Point (simple problems), Managerial Significance and limitations of BEA.

UNIT III
Introduction to Markets and Pricing Strategies: Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Price-Output Determination in case of Perfect Competition and Monopoly, Concept on different pricing strategies.

UNIT IV
Introduction to Management: Concepts of Management and organization: Nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas

McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

UNIT V

Introduction to Marketing and Human Resource Management (HRM): Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of distribution.

Human Resources Management (HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

Text Books:

1. Managerial Economics – Varshney and Maheswari, Sultan and Chand, New Delhi, 2003
2. Principles of Management – Ramaswamy,T, Himalaya Publishing House, Mumbai, 2008.
3. Marketing Management – Phillip Kotler and Kevin Lane Keller, PHI Learning Private Limited, 2006, 12/e.
4. Personnel and Human Resource Management: Text and Cases – P.Subba Rao, Himalaya Publishing Houses, Mumbai.

Reference Books:

1. Managerial Economics, Dwivedi, Vikas Publications, 2009, 6/e.
2. Principles of Management – Koonz, Weihrich and Aryasri, Tata McGraw Hill, 2004.
3. Marketing Management: Texts and Cases – Tapan K. Panda, Excel Books, 2008, 2/e.
4. Marketing Management – Rajan Saxena, Tata Mc Graw Hill, 2009, 4/e.
5. Human Resource Management – Aswathappa, Mc Graw Hill, 2009.
6. Personnel Management – Edwin B.Flippo, Mc Graw Hill, 2003.

MICROPROCESSORS AND MICROCONTROLLERS

Subject Code: 13EC3019 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Identify the components and study the architectural features of the computers (CPU, Registers, Stack, Etc) microprocessors, addressing modes, instruction set, assembler directives of 8086 microprocessors
- Develop assembly language program with an assembler and understand stack structure, interrupts of 8086.
- List the salient features of 80386 microprocessor and explaining the operating modes of 80386.
- Study the varies peripheral devices like 8255, 8279, 8257, 8251.
- Identify the components and study the architectural features addressing modes, timers of 8051 microcontroller.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Summarize the architectural features of 8086 microprocessor.
CO2: Write assembly language programs and can handle DOS/BIOS routines and interrupt structures.
CO3: Choose the appropriate operating modes of 80386 to relate with the application.
CO4: Interface varies peripherals with 8086 microprocessor.
CO5: Summarize the architectural features of 8051, PIC controller.

UNIT - I
Microprocessor 8086: Introduction, architecture, register organization, memory organization, signal description and pin diagram, addressing modes, assembler directives, procedures, macros and timing diagrams of 8086.

UNIT II
Assembly Language Programming of 8086: Instruction set, assembly language programs, introduction to stack, stack structure, classification of interrupts, interrupt service routine and interrupt vector table.

UNIT III
ADVANCED MICROPROCESSORS:
Architecture Features, register organization, signal description, data types and physical address calculation, mode of operations, segmentation and paging of 80386. Introduction to 80486.

UNIT IV
Interfacing with 8086: Programmable interrupt controller (8259A) – Programmable Peripheral Interface (8255), modes of operation of 8255 – DMA controller (8257) – Key board/display controller (8279) – Programmable communication interface (USART) (8251).

UNIT-V

Microcontrollers: Introduction, architecture, signal description, pin diagram, register set, memory organization, parallel I/O ports, interrupts and addressing modes of 8051. Introduction to PIC microcontrollers

Text books:

1. Advanced Microprocessors and Peripherals – A K RAY and K M Bhurchandi, Tata McGraw-Hill Publications, 2000.
2. Microprocessors and Interfacing – Douglas V Hall, McGraw-Hill.
3. Microprocessors and Microcontrollers – Berry B. Bray, Tata McGraw-Hill Publications.

Reference books:

1. Microcontrollers – Ajay V Deshmukh, Tata McGraw Hill publications.
2. Microprocessor 8086 programming and Interfacing – Nagoor kani, RBA publications.

DIGITAL SIGNAL PROCESSING

Subject Code: 13EC3020 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To study the different types of discrete time signals and systems and their properties.
- To calculate the Fourier series and Fourier transform for the different discrete time signals and also calculate the Fourier Transform of a given sequence based on FFT algorithms
- To design a FIR and IIR filters using different techniques
- To implement the sampling rate conversion
- To identify the DSP Processor architecture and understand the function of each block

Course Outcomes:

At the end of the course the student will be able to:
CO1: Discriminate the discrete systems based on their basic properties
CO2: Determine the frequency response of different signals using DFT and FFT
CO3: Design FIR and IIR filters using different techniques
CO4: Use up and down sampling of signals in multirate signal processing
CO5: Identify the architecture of DSP processor and understand the function of each element

UNIT I

Introduction: Discrete time signals and sequences, linear shift invariant systems, stability and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences.

UNIT II

Discrete Fourier transform: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT.

Fast Fourier Transform: Radix-2 decimation in time and decimation in frequency algorithms, inverse FFT and FFT for composite N.

Z – Transform: Definition, properties, ROC, inverse Z-Transform, relation between Fourier transform and Z-transform and applications.

UNIT III

IIR Digital Filters: Solution of difference equations of digital filters, block diagram representation of linear constant-coefficient difference equations, basic structures of IIR systems (Direct form, Cascade form, Parallel form and Lattice – Ladder), transposed forms.

Analog filter approximations – Butterworth and Chebyshev, design of IIR digital filters from analog filters (mapping of differentials, bi – linear transformation, impulse invariant method, matched z – transforms), design examples, frequency transformation (analog and digital domains), problems.

UNIT IV

FIR Digital Filters: Basic structures of FIR systems (Direct form, Cascade form, Frequency Sample, Lattice), Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency sampling technique. Comparison of IIR and FIR filters.

Multirate Digital Signal Processing: Decimation, interpolation, sampling rate conversion. Implementation of sampling rate conversion.

UNIT V

Introduction to DSP Processors: Introduction to programmable DSPs, Multiplier and Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS 320C5X- Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Registrar, Index Registrar, Auxiliary Registger Compare Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On- chip registers, On-chip peripherals.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications – John G. Proakis, Dimitris G.Manolakis, Pearson Education/PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI.
3. Digital Signal Processors – Avatar Singh, S. Srinivasan, Cengage Learning Ind. Pvt. Ltd., 2004.

Reference Books:

1. Digital Signal Processing – Andreas Antoniou, Tata McGraw Hill , 2006.
2. Digital Signal Processing – MH Hayes, Schaum’s Outlines, Tata Mc-Graw Hill, 2007.

VLSI DESIGN

Subject Code: 13EC3021 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Understand the VLSI design and VLSI technologies.
- Describe basic circuit concepts.
- Explain how to draw stick and layout diagrams.
- Know delays and scaling of MOS circuits.
- Demonstrate the basics of HDL,Synthesis and Simulation

Course Outcomes:

At the end of the course the student will be able to:
CO1: Identify different MOS technologies for VLSI design
CO2: Distinguish characteristics of CMOS and BICMOS
CO3: Draw the stick &layout diagrams of various circuits
CO4: Calculate delays and scaling parameters of MOS circuits
CO5: Design and test CMOS circuits.

UNIT I
Introduction: Introduction to IC technology, the IC era, MOS and related VLSI technology and basic MOS transistors. IC production process, MOS and CMOS fabrication process. Bi-CMOS technology and comparison between CMOS and bipolar technologies.

UNIT II
Basic electrical properties of MOS and Bi-CMOS circuits : I_{ds} – V_{ds} relationship, aspects of MOS transistor: threshold voltage, trans-conductance, output conductance and figure of merit. Pass transistor, MOS inverter, determination of pull-up to pull-down ratio of NMOS. NMOS inverter driven by another NMOS inverter and driven through one or more passes transistors. Alternative forms of pull-up, CMOS inverter.

UNIT III
VLSI Circuit design process: VLSI design flow, layers of abstraction and stick diagrams. Design rules for wires, contacts and transistor layout diagrams for NMOS and CMOS inverters and gates.
Scaling of MOS circuits: Scaling models, scaling factors for device parameters and limitations of scaling.

UNIT IV
Gate Level Design: Logic gates and other complex gates, switch logic, alternate gate circuits.
Basic circuit concepts: Sheet resistance (R_s) and its concept to MOS. Area capacitance calculations, delays, driving large capacitive load, wiring capacitances, fan-in and fan-outs and choice of layers.

Scaling of MOS circuits: Scaling models, scaling factors for device parameters and limitations of scaling.

UNIT V

Design Methods: Design-capture tools and design- verification tools.

CMOS Testing: Need for CMOS testing, manufacturing test principles and design strategies for test. Chip level test techniques and system level test techniques.

Text books:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005.
2. Principles of CMOS VLSI Design – Weste and Eshraghian, Pearson Education, 1999.

Reference books:

1. VLSI Design – Debaprasad Das, Oxford university press, 2010.
2. VLSI Design – A.Albert Raj and T.Latha, PHI Learing private limited 2010.
3. ASIC design - Smith.

TV AND SATELLITE COMMUNICATIONS
(Elective – I)

Subject Code: 13EC3022 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To get knowledge on TV fundamentals, scanning process and composite video signal, TV signal transmission and propagation.
- To study TV camera tubes, picture tubes, colour Television characteristics and signal generation.
- To learn the working of Monochrome and color TV receiver.
- To study basics of satellite systems, Orbital Mechanics and Launchers.
- To get relevant knowledge on satellite subsystem, link design and communications techniques.

Course Outcomes:

At the end of the course the student will be able to
CO1: Learn the working principles of television transmitter, receiver, image continuity, scanning, TV signal modulation, transmission & propagation.
CO2: Familiarize with monochrome and colour camera tubes, picture tubes, colour signal generation and different Television standards.
CO3: know the working of Monochrome and colour TV receiver and their subsystems.
CO4: learn the basics of Satellite communications, Orbital mechanics and launchers.
CO5: Describe satellite subsystems, satellite orbits, LEO and Geo Stationary systems

UNIT I
Introduction: TV transmitter and receiver, synchronization. Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal. Horizontal sync, vertical sync and scanning sequence.
TV Signal Transmission and Propagation: Picture signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel band width, TV transmitter, TV signal propagation, interference, TV broadcast channels and TV transmission antennas.

UNIT II
TV Cameras and picture tubes: Camera tube types, monochrome and colour TV camera. Monochrome and colour picture tubes. Picture tube characteristics and specifications.
Colour signal generation and encoding: Perception of brightness and colours, additive colour mixing, video signals for colours, luminance signal and colour difference signals, encoding of colour difference signals and formation of chrominance signals.
TV Standards: 525 line TV system, 625 line system, NTSC and PAL colour systems. PAL encoder.

UNIT III

Monochrome and colour TV receiver: Subsystems of black and white receiver, RF tuner, IF subsystems, video amplifier, sound section, sync separation and processing, deflection and scanning circuits.

PAL-D Colour Receiver: Subsystems, Y-signal channel, Chroma decoder, Separation of U & V colour Phasor, synchronous demodulators, subcarrier generation, raster circuits, color burst separation, burst phase discriminator, AGC amplifier, reference oscillator, indent and colour killer.

UNIT IV

Introduction to satellite communication: Origin, historical background, basic concepts, frequency allocations, applications and future trends.

Orbital mechanics and launchers: Orbital mechanics, look angle determination, orbital perturbations, orbit determination, launches and launch vehicles. Orbital effects on communication system performance.

UNIT V

Satellite subsystems and link design: Attitude and orbit control system, telemetry, tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification. Basic transmission theory, design of up and down links, design of satellite links for specified C/N and system design example.

Low earth orbit and Geo – stationary satellite systems: Orbit consideration, coverage and frequency consideration, delay and throughput considerations and system consideration.

Text books:

1. Monochrome and Colour TV – R.R. Gulati, New Age International Publication, 2002.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, Pearson Publications, 2003, 2/e.

Reference books:

1. Television and Video Engineering – A.M. Dhake, Tata McGraw Hill, 2/e.
2. Satellite Communication – D.C Agarwal, Khanna Publications, 5/e.

BIO – MEDICAL SIGNAL PROCESSING
(Elective – I)

Subject Code: 13EC3023 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To expose the students to the basic concepts of different data reduction algorithms and transform techniques
- To expose the students to know about the functioning of cardio vascular signal processing.
- To expose the students to know about the functioning of Neurological signal processing.
- To provide adequate knowledge about adaptive filtering techniques to remove noise in bio logical signals.
- Signal averaging and by different methods

Course Outcomes:

At the end of the course the student will be able to:

CO1: Describe different data compression techniques for processing of ECG signals

CO2: Discuss the cardio-vascular system, ECG pattern recognition and heart rate variability analysis.

CO3: Discuss briefly about EEG signals based on stage analysis, inverse filtering of EEG signals

CO4: Distinguish different adaptive algorithms to enhance the ECG and EEG signals

CO5: Discuss about different signal averaging methods.

UNIT I

Data compression techniques: Lossy and lossless data reduction algorithms. ECG data compression using turning point, AZTEC, CORTES, Hoffman coding, vector quantization, DCT and KL transform.

UNIT II

Cardiological signal processing: Pre-processing – QRS detection methods – Rhythm analysis. Arrhythmia detection algorithms – automated ECG analysis – ECG pattern recognition – heart rate variability analysis.

UNIT III

Neurological signal processing: Modeling of EEG signals – detection of spikes and spindles – detection of alpha, beta and gamma waves. Auto regressive modeling of seizure EEG – sleep stage analysis. Inverse filtering – least squares and polynomial modeling.

UNIT IV

Adaptive noise canceling: Principles of adaptive noise canceling – Adaptive noise canceling with the LMS adaptation algorithm. Noise canceling method to enhance ECG monitoring – fetal ECG monitoring.

UNIT V

Signal averaging, polishing – mean and trend removal – Prony's method. Linear prediction – Yule–walker(Y–W) equations.

Original Prony's method – Prony's method based on the least squares estimate – analysis of evoked potentials.

Text books:

1. Biomedical Signal Processing: Principles and techniques – D.C.Reddy, Tata McGraw-Hill, 2005.
2. Biomedical Digital Signal Processing – Willis J.Tompkins, PHI.
3. Biomedical Signal Analysis – Rangaraj M. Rangayyan, IEEE Press, 2001.

Reference books:

1. Digital Bio signal Processing – Weitkunat R, Elsevier, 1991.
2. Biomedical Signal Processing – Akay M, Academic Press, 1994.
3. Biomedical Signal Processing Time and Frequency Analysis (Vol. I) – Cohen.A, CRC Press,1986.

ANALOG IC DESIGN
(Elective – I)

Subject Code: 13EC3024 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

The student will be able to

- Know different current mirrors and noise in Op amps.
- Design and analyze Phase locked loop.
- Understand switched capacitor circuits.
- Explain design of CMOS comparators.
- Understand nyquist rate A/D and D/A converters.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Explain the techniques of design and layout of analog circuits using CMOS.
CO2: Know the concepts of circuit design problems in real time applications.
CO3: Know Design and analysis of PLL circuits.
CO4: Summarize switched capacitor circuits and comparators.
CO5: Distinguish different A/D &D/A converters.

UNIT I
Current mirrors and single stage amplifiers: Simple CMOS, BJT current mirror and cascode Wilson Wilder current mirrors. Common Source amplifier, source follower, common gate amplifier.
Noise: Types – Noise in Op – amps – Noise in common source amplifier.

UNIT II
Phased locked loop design: PLL concepts - The phase locked loop in the locked condition. Integrated circuit PLLs – phase detector – voltage controlled oscillator case study: analysis of the 560B monolithic PLL.

UNIT III
Switched capacitor circuits – 1: Basic building blocks op-amps capacitors switches – non-over lapping clocks – Basic operations and analysis-resistor equivalence of a switched capacitor – Parasitic sensitive integrator parasitic insensitive integrators signal flow graph analysis. First order filters – Switch sharing fully differential filters – charged injections.

UNIT IV
Switched capacitor circuits – 2: Switched capacitor gain circuit – Parallel resistor-capacitor circuit – Preset table gain circuit – Other switched capacitor circuits – Full wave rectifier – Peak detector sinusoidal oscillator.
CMOS comparator circuits: Performance metrics of comparator, two-stage comparator: analysis and design, auto-zeroing of comparator and hysteresis of comparator.

UNIT V

Nyquist Rate A/D Converters: Integrating converters – successive approximation converters – DAC based successive approximation – flash converters.

Nyquist Rate D/A Converters: Decoder based converters – Resistor storing converters – Folded resister string converters – Binary scale converters – Binary weighted resistor converters – Reduced resistance ratio ladders – R-2R based converters – Thermometer code current mode D/A converters.

Text Books:

1. Analog Integrated circuit Design – David A Johns, Ken Martin, John Wiley & Sons.
2. Analysis and design of Analog Integrated Circuits – Gray, Hurst Lewis, Meyer. John Wiley and Sons.

Reference Books:

1. Design of Analog CMOS Integrated Circuits – Behzad Razavi, Tata McGraw Hill.

TRANSFORM TECHNIQUES
(Elective – I)

Subject Code: 13EC3025 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To aware the student about the importance of different transforms.
- To explain time-frequency and multi resolution analysis of transforms
- To explain continuous and discrete wavelet transform and its properties.
- To explain the concept of filter banks
- To explain applications of transforms in signal and image processing

Course Outcomes:

At the end of the course the student will be able to:
CO1: Explain different 2D transforms.
CO2: Compute time frequency and multi-resolution analysis of different transforms.
CO3: Distinguish the importance of continuous and discrete wavelet transforms.
CO4: Explain construction of perfect filter banks.
CO5: Apply wavelet transform methods to signal and image processing applications.

UNIT I
Introduction to image transforms: Introduction, need for transform, 2D discrete Fourier transform, properties of 2D – DFT. Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine Transform, Karhunen – Loeve transform, Singular value decomposition, Radon Transform and comparison of different image transforms (with examples).

UNIT II
Time – Frequency analysis: Window function, Short time Fourier transform, discrete short time Fourier transform, discrete Gabor representation.
Multiresolution analysis: Orthogonal, biorthogonal and semiorthogonal decomposition. Two scale relations, decomposition relation, spline functions, mapping a function into MRA space.

UNIT III
Continuous and discrete wavelet transforms – 1: Continuous wavelet transform, discrete wavelet transform, wavelet series, interpretations of the time-frequency plot, Wigner-Ville distribution, Quadratic superposition principle, Ambiguity function. Necessary ingredients for wavelet construction, construction of semiorthogonal spline wavelets, construction of orthonormal wavelets, orthonormal scaling functions.

UNIT IV
Continuous and discrete wavelet transforms – 2: Construction of bi-orthogonal wavelets. Decimation and interpolation, signal representation in the approximation subspace, wavelet

decomposition algorithm, reconstruction algorithm, change of bases, signal reconstruction in semiorthogonal subspaces. Two channel perfect reconstruction filter bank, polyphase representation of filter banks, comments on DWT and PR filter banks.

UNIT V

Wavelet packets: Wavelet packets – algorithms – features – algorithms for two dimensional signals.

Applications of transforms: Thresholding – Hard thresholding and soft thresholding implementation. Interference suppression, faulty bearing signature identification, pattern recognition of acoustic signals and image compression.

Text Books:

1. Fundamentals of Wavelets – Jaideva C.Goswami and Andrew K.Chan, Wiley publishers, 2006.
2. Digital image processing – S. Jayaraman, S. Esakkirajan and T. Veerakumar, Mc Graw Hill publishers, 2009.

Reference Book:

1. Insight into Wavelets: from theory to practice – K.P.Soman and K.I Ramachandran, PHI, 2008, 2/e.
2. Multirate systems and filter banks – P.P.Vaidyanathan, Pearson education, 2008.

OOPS THROUGH JAVA
(Elective – I)

Subject Code: 13EC3026 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

This course provides an introduction to object oriented programming (OOP) using the Java programming language.

- Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm
- Well equipped with java SDK environment to create, debug and run simple java programs

Course Outcomes:

At the end of the course the student will be able to:

CO1: Become familiar with the fundamentals and acquire programming skills in java language.

CO2: Understand the fundamentals of object oriented programming in java, including defining classes, objects, invoking methods using class libraries etc.

CO3: Able to understand and apply various object oriented feature like inheritance, polymorphism to solve various computing problems and take the statement of a business problem and form this determine suitable logic for solving problem.

CO4: Identify java's standard packages and different levels of member access and how they relate to packages and implement error handling techniques using exception handling.

CO5: Able to explore common issues encountered when creating a cross platform multi threaded application and also develop efficient java applets.

UNIT I

Introduction: C
reation of Java, byte code, Java buzzwords, OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

UNIT II

Classes and Objects: Concepts of classes and objects, class fundamentals Declaring objects, introducing methods, constructors, usage of static with data and methods, access control, this key word, garbage collection, overloading methods and constructors, parameter passing – call by value, recursion.

UNIT III

Inheritance: Basic concepts, member access rules, usage of super key word, types of inheritance, method overriding, abstract classes, dynamic method dispatch, final keyword.

Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an

interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT IV

Exception Handling and Multithreading: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, deadlocks.

UNIT V

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

AWT Controls: Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, menus, graphics class

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swings: JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons –The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees and Tables.

Text Books:

1. The Complete Reference Java J2SE – Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 5/e.
2. Learn Object Oriented Programming Using Java: An UML Treatment using Live Examples from Science and Engineering – Dr. N.B. Venkateswarlu, Dr. E.V. Prasad, S Chand, New Delhi.
3. Big Java – Cay Horstmann, John Wiley and Sons, 2/e.

Reference Books:

1. Java How to Program - H.M.Dietel and P.J.Dietel, Pearson Education/PHI, 6/e.
2. Core Java 2, Vol 1(Fundamentals) – Cay.S.Horstmann and Gary Cornell, Pearson Education, 7/e.
3. Core Java 2, Vol 2 (Advanced Features) – Cay.S.Horstmann and Gary Cornell, Pearson Education, 7/e.

MICROPROCESSORS AND MICROCONTROLLER LAB

Subject Code: 13EC3109 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

- To study and develop assembly language programs using arithmetic instructions.
- To study and develop assembly language programs using logical instructions.
- To study and develop assembly language programs using string instructions.
- To Study the interfacing of the processor with various peripheral devices
- To learn assembly language programs on 8051 micro controller

Course Outcomes:

At the end of the course the student will be able to:
CO1: Write assembly language programs using arithmetic instructions.
CO2: Write assembly language programs using logical instructions.
CO3: Write assembly language programs using string instructions.
CO4: Write 8086 interfacing programs by using 8255 and 8279.
CO5: Write assembly language programs on 8051 micro controller

List of Experiments (At least ten experiments are to be done) :

I. Microprocessor 8086

1. Introduction to MASM/TASM.
2. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
5. DOS/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.

II. Microcontroller 8051

1. Reading and Writing on a parallel port.
2. Timer in different modes.
3. Serial communication implementation.

III. Interfacing

1. 8259 – Interrupt controller : Generate an interrupt using 8259 timer.
2. 8279 – Keyboard display : Write a small program to display a string of characters.
3. 8255 – PPI : Write ALP to generate sinusoidal wave using PPI.
4. 8251 – USART : Write a program in ALP to establish Communication between two processors.
5.

DIGITAL SIGNAL PROCESSING LAB

Subject Code: 13EC3110 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

- To support the teaching of basic concepts in digital signal processing using computer simulations and appropriate hardware.
- To produce graduates who understand how to analyze and manipulate digital signals and have the fundamental Mat lab programming knowledge to do so.
- To use the Fast Fourier Transform in a variety of applications including: signal analysis, fast convolution
- To Design and implement FIR filters using several different methods, and explain the advantages and disadvantages of the various approaches
- To Design and implement IIR filters using several different methods, and explain the advantages and disadvantages of the various approaches

Course Outcomes:

At the end of the course the student will be able to:
CO1: Compute linear convolution and circular convolution
CO2: Design IIR and FIR filters with relevant techniques
CO3: Calculate DFT by using FFT algorithms
CO4: Write MATLAB programs for various signal processing techniques.
CO5: Summarize DSP processor TMS320C5X/6X

List of Experiments:

1. To study the architecture of DSP chips – TMS 320C 5X/6X instructions.
2. To verify linear convolution.
3. To verify the circular convolution.
4. To design FIR filter (LP/HP) using windowing technique.
   i. Using rectangular window.
   ii. Using Hamming window.
   iii. Using Kaiser Window.
5. To implement IIR filter (LP/HP) on DSP processors.
6. N – point FFT algorithm.
7. MATLAB program to generate sum of sinusoidal signals.
8. MATLAB program to find frequency response of analog LP/HP filters.
9. To compute power density spectrum of a sequence.
10. To find the FFT of given 1 – D signal and plot.

HDL PROGRAMMING LAB

Subject Code: 13EC3111 **External Marks: 50**
Credits: 3 **Internal Marks: 25**

Course Objectives:

- Examine the working of combinational circuits using IC'S
- Describe the working of sequential circuits using IC'S
- Analyze the operation of RAM
- Learn hardware description language modeling of combinational and sequential circuits.
- Develop the digital circuits in different modeling techniques using active HDL.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Apply switching theory to verify truth tables of gates
CO2: Summarize the logical properties of combinational logic circuits
CO3: Analyze the logical properties of flip flops in designing of counters and registers
CO4: Test the read/write operations of RAM
CO5: Write & implement VHDL programs of combinational & sequential circuits

List of Experiments (At least ten experiments are to be done) :

The students are required to design and draw the internal structure of the following digital integrated circuits and to develop VHDL source code. Perform simulation using relevant simulator. Further, it is required to verify the logical operations of the digital ICs (hardware) in the laboratory**.**

1. Logic gates
2. 3-8 Decoder -74138
3. 8 x 1 Multiplexer -74151 and 2x4 Demultiplexer-74155
4. 4bit comparator – 7485
5. D Flip-Flop – 7474
6. Decade counter – 7490
7. 4bit counter – 7493
8. Shift registers – 7495
9. Universal shift register – 74194/195
10. RAM (16x4) – 74189 (Read and Write operations)
11. Stack and queue implementation using RAM
12. ALU design

SELF STUDY COURSE – II

Subject Code: 13EC3202 **External Marks: 0**
Credits: 1 **Internal Marks: 75**

- Self study course – II (4 periods per week) includes e – learning, internet learning and presentation skills.
- Out of 75 marks, 25 marks for day – to – day evaluation (self study report and seminar given by the student) and 50 marks on the basis of end examination conducted by internal (department) committee.
- At end of semester the students are require to submit a self study report and to write an objective examination (50 multiple choice questions – 50 X 1 = 50 marks) pertaining to any one of the following fields:

1) **ROBOTICS – II:**
Introduction to Matrix formulations: Descriptions - Positions - Orientations, frames, Mappings - Changing descriptions from frame to frame. Transformation arithmetic - translations - rotations - transformations - transform equations – rotation matrix, transformation of free vectors. Introduction to manipulations – Forward Kinematics and inverse Kinematics.
Robot Programming: Methods of Robot Programming - on-line/off-line - Show and Teach - Teach Pendant - Lead and Teach. Explicit languages, task languages - Characteristics and task point diagram. Lead Teach method – robot program as a path in space - motion interpolation - WAIT - SIGNAL - DELAY Commands - Branching - capabilities and Limitations. 1st and 2nd generation languages - structure - Constants, Variables data objects - motion commands – end effector and Sensor commands.

2) **ESTIMATION, IDENTIFICATION, AND ADAPTIVE CONTROL:** Fundamentals of signal estimation, system identification techniques, and adaptive methods in systems control and signal estimation. Linear systems with random inputs, Kalman Filtering and its applications. Continuous and discrete-time systems identification and basic adaptive algorithms such as LMS, RLS, and stochastic approximations. Adaptive control methods such as the self-tuning regulation and model reference adaptive control with process control applications.

3) **HIGH-FREQUENCY ELECTRONICS:** A study of devices and circuits used in high-speed communications systems. Microwave bipolar transistors, GaAs MESFETs, and high-speed integrated circuits; and the design of linear and power amplifiers using S-parameter techniques and computer simulation.

4) **SPREAD SPECTRUM COMMUNICATIONS:** Pseudonoise spread spectrum systems, feedback shift registers, jamming strategy, code acquisition, synchronization, tracking, gold codes, burst-communication systems, time-hopping, frequency-hopping, and multiple access communications. CDMA and WCDMA techniques.

5) **FAST ALGORITHMS AND ARCHITECTURES FOR DIGITAL SIGNAL PROCESSING:** Recent advances in the development of signal processing algorithms and relevant computational architectures. Topics include fast polynomial transforms, Winograd's algorithms, multi rate processing of digital signals, spectral estimation, adaptive filtering, parallel and pipeline computational arrays, and mapping of signal processing algorithms into systolic arrays.
6) **INDUSTRIAL ELECTRONICS – II:**
   Motor Control: Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.
   Timers and Welding circuits: Basic timer circuits, applications of welding circuits, resistance welding and energy storage welding.
   Heating circuits: Introduction and applications of induction and dielectric heating control.

DIGITAL IMAGE PROCESSING

Subject Code: 13EC4027 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To understand the basic definitions that are associated with image processing and to give an overview of image types, imaging applications.
- To study the digital image processing transforms.
- To provide an overview of digital image enhancement.
- To study the degradation models of image restoration techniques and distinguish color image models used in image processing
- To develop Compression algorithms, and interpret image segmentation.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Describe how images are formed, sampled, quantized, represented digitally and explain transform-domain representation of images

CO2: apply the image transforms in image compression, watermarking etc,.

CO3: Apply the image intensity transformations and filtering for the purpose of image enhancement in the spatial and frequency domains.

CO4: Interpret image restoration in the spatial and frequency domains, summarize color models and processing color images.

CO5: Distinguish compression algorithms and apply different types of edge detection and segmentation algorithms

UNIT I

Introduction to image processing: Digital image fundamentals. Digital image through scanner, digital camera, Concept of gray levels, Gray level to binary image conversion, Sampling and quantization, Relationship between pixels, Imaging Geometry.

UNIT II

Image Transforms: 2-D FFT and its properties, Walsh transform, Hadamard Transform, Discrete cosine Transform. Haar transform, Slant transform, Hotelling transform, Discrete wavelet transform.

UNIT III

Image enhancement:

Spatial domain: Image quality and need for Image enhancement, Point processing, Histogram processing, Spatial filtering.

Frequency domain: Image smoothing, Image sharpening, Homomorphic filtering.

UNIT IV

Image Restoration: Image Restoration, Degradation model, Algebraic approach to restoration, Inverse filtering, Least mean square filters, Constrained Least Squares Restoration.

Colour image processing: Introduction- colour fundamentals, colour models, Pseudo colour image processing, full colour image processing.

UNIT V

Image compression: Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression.

Image segmentation: Introduction-classification of image segmentation algorithms, Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation.

TEXT BOOKS:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson Education, 2nd Edition, 2002.

REFERENCE BOOKS:

1. Fundamentals of Digital Image processing – A.K.Jain , PHI.
2. Image Processing, Analysis and Machine Vision 3rd edition - Milan Sonka, Vaclav Hlavac, Roger Boyle.
3. S. Jayaraman, S. Esakkirajan, T. Veerakumar," Digital Image processing" McGraw Hill Publishers, 2009.

RADAR ENGINEERING

Subject Code: 13EC4028 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Analyze the concepts of different Radar constants, block diagrams, frequencies and simple range equation.
- Differentiate between basic principles of CW radar and Frequency modulated radars.
- Identify different types of MTI radars and its principles.
- Identify different types of tracking radars and its principles.
- Describe the detection of radar signals in noise and different display systems.

Course Outcomes:

At the end of the course student will be able to

CO1: Assess the concepts of different Radar constants, frequencies and simple range Equation and analyze the operation of simple Radar.

CO2: Differentiate between basic principles of CW radar and Frequency modulated radars.

CO3: Distinguish between different types of MTI radars and its principles.

CO4: Distinguish between different types of tracking radars and its principles.

CO5: Synthesize the detection of radar signals in noise and Analyze different displays.

UNIT-I

Introduction, Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications

RADAR EQUATION: Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities

UNIT-II

CW AND FM CW- RADAR: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications, FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics , FM-CW altimeter, Measurement errors Multiple frequency CW radar

UNIT-III

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, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, Non –coherent MTI radar, MTI versus Pulse Doppler Radar.

UNIT-IV

TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one & two coordinates), Phase Comparison Monopulse, Target Reflection Characteristics and Angular Accuracy, Tracking in Range, Acquisition and Scanning Patterns. Comparison of Trackers.

UNIT-V

DETECTION OF RADAR SIGNALS IN NOISE: 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.

RADAR RECEIVERS: Displays – types, Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased array antennas

TEXT BOOKS:

1. Merrill I. Skolnik, “Introduction to Radar Systems”, 2nd Ed., McGraw-Hill, 1981.
2. Simion. Kingsley, “Understanding Radar Systems”, Standard Publishing, 1999.

REFERENCE BOOKS:

1. G.Sasi Bhushana Rao, “Microwave and Radar engineering”, Pearson education, 2013.
2. Introduction to Radar Systems – Merrill I. Skolnik, Third Edition, Tata McGraw-Hill, 2001.

MICROWAVE ENGINEERING

Subject Code: 13EC4029 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To apply electromagnetic theory to calculations regarding waveguides and transmission lines.
- To characterize microwave systems and components in terms of network theory (Scattering matrix, ABCD matrix, impedance matrix, etc.)
- To analyze the difference between the conventional tubes and the microwave tubes for the transmission of the EM waves.
- To design microwave components such as power dividers, hybrid junctions, microwave filters, ferrite devices, and single-stage microwave transistor amplifiers
- To handle microwave equipment and make measurements

Course Outcomes:
At the end of the course the student will be able to:
CO1: Apply the EM theory for calculation of various parameters related to waveguides and cavity resonators.
CO2: Integrate a wide range of microwave components for various applications.
CO3: Analyze the difference between the conventional tubes and the microwave tubes for the transmission of the EM waves.
CO4: Comprehend the design aspects of O-type tubes and its characteristics.
CO5: Analyze basic principles and operation of microwave solid state devices, Perform various measurements using microwave equipment.

UNIT I
MICROWAVE TRANSMISSION LINES: Introduction, Microwave Bands, Application Introduction to guided waves- TE, TM, TEM Modes Waveguides: Rectangular wave guide - TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Mode Characteristics. Cavity Resonators– Introduction, types.

UNIT II
WAVEGUIDE COMPONENTS: Coupling Mechanisms - probe, loop, Waveguide Attenuators, Waveguide Phase Shifters, Scattering Matrix, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee, Hybrid Ring; Directional Couplers, Faraday Rotation; Ferrite Components – Gyrator, Isolator, Circulator.

UNIT III
MICROWAVE TUBES – I: Limitations of conventional tubes at microwave frequencies, classifications.
O-type tubes: Two Cavity Klystrons – Velocity Modulation Process, Bunching Process, o/p Power and Efficiency. Multi cavity klystron. Reflex Klystrons – Mathematical Theory of

Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics.

UNIT IV

MICROWAVE TUBES –II:

HELIX TWTS: Slow Wave Structures; TWT- Amplification Process, Suppression of Oscillations, Nature of the four Propagation, Constants and Gain Considerations. M-type Tube: Magnetrons – Types, 8-Cavity Cylindrical Magnetron – Hull Cut-off, Hartree Conditions and PI- Mode Operation.

UNIT V

MICROWAVE SOLID STATE DEVICES: Gunn Diode – Principle, RWH Theory, Characteristics. Avalanche Transit Time Devices – IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR and Impedance.

TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. G. Sasi Bhushana Rao, “Microwave and Radar Engineering”, Pearson education, 2013.

REFERENCE BOOKS:

1. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.

TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS

Subject Code: 13EC4030 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To describe the evolution of telecommunications and switching systems.
- To recite various switching techniques.
- To acquire knowledge about telephone networks and signaling techniques.
- To explain about network architecture and OSI reference model.
- To analyze different switching networks used in data communication.
- To describe the Integrated Services Digital Networks (ISDN) concepts.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Comprehend the evolution of telecommunications and switching systems.
CO2: Classify different types of switching techniques.
CO3: Describe the concepts of telephone networks and compare signalling techniques.
CO4: Illustrate the OSI reference model and various types of networks.
CO5: Differentiate various switching networks in Data communication.
CO6: Categorize the applications of Integrated Services Digital Networks (ISDN).

UNIT I

INTRODUCTION: Evolution of telecommunications, simple telephone communications, basics of a switching system, classification of switching systems, major telecommunication networks. Switching network configuration, principles of cross bar switching.

UNIT II

ELECTRONIC SPACE DIVISION SWITCHING: stored program control, centralised SPC, Distributed SPC, Two stage networks. Time division switching: basic time division space switching , basic time division time switching , time multiplexed space switching, time multiplexed time switching, combination switching.

UNIT III

TELEPHONE NETWORKS: Subscriber loop systems, transmission plan, numbering plan, charging plans. call progress tones, call procedure, DTMF dialing.
SIGNALING TECHNIQUES: In channel signalling, common channel signalling, Network traffic load and parameters, grade of service.

UNIT IV

DATA COMMUNICATION NETWORKS: Introduction, network architecture, layered network architecture, protocols, data communications hardware, data communication circuits. Public switched data networks, Circuit Switching, packet switching, OSI reference model, LAN, WAN, MAN, Internet. Repeaters, Bridges, Routers, gateways.

UNIT V

INTEGRATED SERVICES DIGITAL NETWORK (ISDN): ISDN architecture, ISDN interfaces, functional grouping, reference points, signalling, numbering, addressing, BISDN. DSL Technology: ADSL, Cable Modem, HFC Networks, Sharing, CM & CMTS and DOCSIS, SONET.

TEXT BOOKS:

1. Tele communication switching system and networks - Thyagarajan Viswanath, PHI, 2000.
2. Data Communications & Networks - Achyut. S.Godbole, TMH, 2004.

REFERENCE BOOKS:

1. Data Communication & Networking - B.A. Forouzan, TMH, 3rd Edition, 2004.
2. Advanced electronic communications systems - Wayne Tomasi, PHI, 2004.
3. Telecommunication switching, Traffic and Networks - J E Flood, Pearson Education.

WIRELESS COMMUNICATION NETWORKS (ELECTIVE – II)

Subject Code: 13EC4031 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Explain multiple access techniques
- Describe blue tooth and wireless data services
- Understand the concepts of Mobile IP and WAP..
- Explain WLAN and wireless networking concepts.
- Understand WATM and HIPERLAN.

Course Outcomes:

At the end of the course, the student will be able to
CO1: Describe various multiple access techniques
CO2: Explain Bluetooth and wireless data services.
CO3: Explain the operation of Mobile IP and WAP
CO4: Describe IEEE 802and mobile data networks
CO5: Describe wireless ATM and HIPERLAN.

UNIT I

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction, FDMA, TDMA, Spread Spectrum, Multiple access, SDMA, Packet radio, CSMA protocols

INTRODUCTION TO WIRELESS NETWORKING: Introduction, Difference between wireless and fixed telephone networks, Traffic routing in wireless networks. Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs,

UNIT II

WIRELESS DATA SERVICES: CDPD, ARDIS, RMD, ISDN, BISDN and ATM, SS7.

BLUE TOOTH: Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol. Introduction to WLL Technology.

UNIT III

MOBILE IP AND WIRELESS ACCESS PROTOCOL: Mobile IP Operation of mobile IP, Co-located address, Registration, Tunnelling, WAP Architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, Wireless datagram protocol.

UNIT IV

IEEE 802 protocol Architecture, IEEE802 architecture and services, 802.11 medium access controls, 802.11 physical layer.

MOBILE DATA NETWORKS: Introduction, Data oriented CDPD Network, GPRS and higher data rates, Short messaging service in GSM, Mobile application protocol.

UNIT V

WIRELESS ATM & HIPER LAN: Introduction, Wireless ATM, HIPERLAN, Adhoc Networking and WPAN.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn., 2002.
2. Wireless Communication and Networking – William Stallings, PHI, 2003.

REFERENCE BOOKS:

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.

SPEECH PROCESSING (ELECTIVE – II)

Subject Code: 13EC4032 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To understand advanced technique algorithms in speech processing like noisy channel model, hidden Markov model and Viterbi algorithms. used for building speech recognition systems
- To understand the components, issues and approaches for constructing spoken dialogue systems.
- To aware of the current state-of-the-art in each of the areas covered

Course Outcomes:

At the end of the course the student will be able to:

CO1: Get familiar with basic characteristics of speech signal in relation to production and hearing of speech by humans.

CO2: Understand basic algorithms of speech analysis common to many applications.

CO3: Give an overview of applications (recognition, synthesis, coding) and be informed about practical aspects of speech algorithms implementation.

CO4: Design filter to remove unwanted noise from the speech

CO5: To know speech recognition using simple ANN models

UNIT – I

FUNDAMENTALS OF DIGITAL SPEECH PROCESSING: Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production, Digital models for speech signals.

UNIT – II

TIME DOMAIN MODELS FOR SPEECH PROCESSING: Introduction, Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs. silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT – III

LINEAR PREDICTIVE CODING (LPC): Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation equations, Pitch Detection and using LPC Parameters.

UNIT – IV

HOMOMORPHIC SPEECH PROCESSING: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The

Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, Mel frequency cepstrum computation.

SPEECH ENHANCEMENT: Nature of interfering sounds, Speech enhancement techniques: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter.

UNIT – V

AUTOMATIC SPEECH RECOGNITION: Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System.

HIDDEN MARKOV MODEL FOR SPEECH RECOGNITION: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMs, Adapting to variability in speech (DTW), Language models.

TEXT BOOKS:

1. Digital processing of speech signals - L.R Rabiner and S.W. Schafer. Pearson Education.
2. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd ed., IEEE Press.

REFERENCE BOOKS:

1. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri 1st ed., PE.
2. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1st ed., Wiley.
3. Speech Recognition - Claudio Becchetti and Lucio PrinaRicotti, Wiley
4. Fundamentals of Speech Recognition. L. R Rabinar and B. H. Juang.

DIGITAL IC DESIGN (ELECTIVE – II)

Subject Code: 13EC4033 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Comprehend the different issues related to the development of digital Integrated circuits including fabrication, circuit design, implementation Methodologies, testing, design methodologies and tools and future Trends.
- Understanding the main principles of various Digital building blocks used in IC design.
- To know the design processes of MOS and CMOS circuits by studying MOS layers, Stick diagrams, Layout diagrams
- To design of various Combinational Logic circuits like Manchester, Carry select and Carry Skip adders, Crossbar and barrel shifters, Multiplexer and various circuits for Static and Dynamic RAM.
- To understand the design of D flips flop using Transmission gates and the design of NOR and NAND based ROM Memory.

Course Outcomes:

At the end of the course the student will be Able To:
CO1: Understand the concepts of MOS Transistor and the CMOS Inverter.
CO2: Understand the concepts and designing of digital building blocks like combinational Logic circuits, sequential logic circuits using VHDL.
CO3: Understand the design of building blocks of digital ICs using various modeling techniques.
CO4: Analyze modes of operation of MOS transistor and its basic electrical properties
CO5: Calculate the parasitic resistance and capacitance produced by the layouts and thus designing circuits with better performance
CO6: Design various combinational circuits using gates and transistors for RAM and ROM

UNIT – I
INTRODUCTION: Historical Perspective, Issues in Digital Integrated Circuit Design, Quality Metrics of a Digital Design: Cost of an Integrated Circuit, Functionality and Robustness, Performance, Power and Energy Consumption.

UNIT – II
MOS TRANSISTOR: The MOS Transistor under Static Conditions, Dynamic Behavior, The Actual MOS Transistor - Some Secondary Effects, SPICE Models for the MOS Transistor, Method of Logical Effort for transistor sizing.

UNIT – III
THE CMOS INVERTER: Introduction, The Static CMOS Inverter - An Initiation Perspective, Evaluating the Robustness of the CMOS Inverter: The Static Behavior,

Switching Threshold, Noise Margins, Robustness Revisited, Performance of CMOS Inverter: The Dynamic Behavior, Computing the Capacitances.

UNIT – IV

LOGIC FAMILIES & CHARACTURISTICS: COMS, TTL, ECL, logic families COMS/ TTL, interfacing comparison of logic families.

COMBINATIONAL LOGIC DESIGN USING VHDL: VHDL modeling for decoders, encoders, multiplexers, comparison, adders and subtractors.

UNIT – V

SEQUENCIAL IC DESIGN USING VHDL: VHDL modeling for latches, flip flaps, counters, shift registers FSMs. ASM charts.

DIGITAL INTEGRADED SYSTEM BUILDING BLOCKS: Multiplexers and decoders – barrel shifters counters digital single bit adder.

TEXT BOOKS:

1. Analog Integrated circuit Design by David A Johns, Ken Martin, John Wiley & Sons.
2. Analysis and design of Analog Integrated Circuits, by Gray, Hurst Lewis, Meyer. John Wiley & Sons.
3. Design of Analog CMOS Integrated Circuits, Behzad Razavi, TMH

REFERENCE BOOKS:

1. Digital Integrated Circuit Design by Ken Martin, Oxford University 2000
2. Digital Design Principles & Practices" by John F Wakerly, Pearson Education & Xilinx Design Series, 3rd Ed. (2002)

ARTIFICIAL NEURAL NETWORKS (ELECTIVE – II)

Subject Code: 13EC4034 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To study basics of biological Neural Network.
- To study basics of artificial Neural Network
- To study applications of ANN
- To study different pattern recognition task using ANN.

Course Outcomes:
At the end of the course, student will be able to
CO1: Learn the basics of biological Neural Network.
CO2: Know the basics of artificial Neural Network.
CO3: Learn the architecture of Feed forward network.
CO4: Explain various applications of ANN
CO5: Describe different pattern recognition task using ANN.

UNIT-I
Introduction to ANN
Features, structure and working of Biological Neural Network. Trends in Computing Comparison of BNN and ANN
Basics of Artificial Neural Networks
History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture

UNIT-II
Back propagation networks (BPN):
Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.

UNIT-III
Activation & Synaptic Dynamics:
Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks.
Basic functional units of ANN for pattern recognition tasks: Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.

UNIT-IV

Feed forward neural networks: Linear responsibility X-OR problem and solution, Analysis of pattern mapping networks summary of basic gradient search methods.

Feedback neural networks: Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning

UNIT-V

Applications of ANN: Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters. NET Talk to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation

TEXT BOOKS:

1. Artificial neural Networks by B. Yegnanarayana, PHI.

2. Neural networks A comprehensive foundations, Simon Haykin, Pearson Education 2nd Edition 2004

REFERENCE BOOKS:

1. Neural networks, Fuzzy logic and Genetic Algorithms by S. Raj sekaran, Vijayalakshmi Pari, PHI
2. "Neural Networks – A Classroom Approach", By Satish Kumar, 2nd Edition, Tata McGraw-Hill, 2004.

DATA BASE MANAGEMENT SYSTEMS (ELECTIVE – II)

Subject Code: 13EC4035 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To introduce basic RDBMS concepts, SQL, Database design and query processing and also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments and various data structures for external data storage and efficient retrieval.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Differentiate Database systems from file systems and define the terminology, features, classifications, Characteristics embodied in database systems.
CO2: Interpret Design and Implement and E-R Model.
CO3: Create / Modify the Structure and write optimized SQL Queries to extract and modify Information from tables or view.
CO4: Apply proper techniques such as normalization and analyze the applicability of a Specific normal form in designing a database.
CO5: Compare various indexing, Hashing and file organization techniques.
CO6: Explain broad range of database Management issues including Data integrity, concurrency recovery and security.

UNIT I:

Data base system applications, database system VS file system- View of data – data abstraction – Instances and schemes – data models – the ER model – Relational model – other models – Database languages – DDL – DML – database access for applications programs - database users and Administrator – Transaction Management – data base system structure – storage manager – the Query processor.

UNIT II:

History of database systems. Database design and ER diagrams – Beyond ER Design – Entities, attributes and entity sets- Relationships and Relationship sets – Additional features of ER Model – Concept design with the ER model – conceptual design for large enterprises. Introduction to the relational model – Integrity constraint over relations- Enforcing Integrity constraints – Querying relational data – Logical data base design – Introduction to views – destroying / altering tables and views. Relational algebra – Selection and projection set operations- renaming – Joins – Division.

UNIT III:

Form of basic SQL Query – Examples of basic SQL Queries-Introduction to nested queries-correlated nested queries set – Comparison operators-Aggregative operators- NULL values – comparison using Null values-Logical connectivity's- AND, OR and NOT- Impact on SQL constructs- Outer joins-Disallowing NULL values- Complex integrity constraints in SQL Triggers and Active databases.

UNIT IV:

Schema refinement-problems caused by redundancy-Decompositions-Problem related to decomposition-reasoning about FDS-FIRST, SECOND, THIRD Normal forms-BCNF-Lossless join decomposition-dependency preserving decomposition-Schema refinement in database design - multi valued dependencies – FORTH normal form. Transaction concept-Transaction state - Implementation of atomicity and durability- concurrent – Executions-serializability- Recoverability - Implementation of Isolation- Testing for serializability - Lock based protocols – Timestamp based protocols – validation – Based protocols – multiple granularity.

UNIT V:

Recovery and atomicity – Log- based recovery – Recovery with concurrent transaction-buffer management – Failure with loss of nonvolatile storage-advance recovery systems-remote backup systems. Data on external storage-File organization and indexing- cluster indexes, primary and secondary Indexed – Index data structures-Hash based indexing-Tree base Indexing-Comparison of file organizations - Indexes and performance tuning-tree Indexes-Indexed sequential access methods (ISAM) – B+ Trees: A Dynamic Index structure. Introduction to database security and authorization, access control, discretionary access control mandatory access control, security for internet applications.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, 3/e , Tata McGraw Hill
2. Database System Concepts, Silberschatz, Korth, 5/e McGraw hill

REFERENCE BOOKS:

1. https://www.coursera.org/course/db
2. Database Systems Design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
3. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
4. Introduction to Database Systems, C.J.Date Pearson Education

AIR QUALITY MANAGEMENT (OPEN ELECTIVE)

Subject Code: 13OE4001 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To identity different pollutants which are causing air pollution.
- To understand the thermodynamics and kinetics of air pollution.
- To apply the professional knowledge of air pollution to design pollution control systems.
- To aim for employment in pollution control organizations.
- To apply the professional, ethics, attitude, team work skills, multi disciplinary approach to contribute the needs of society in the field of environmental protection.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Solve air pollution problems of industries.

CO2: Create awareness among the public on the effects of air pollution at local level as well as global level.

CO3: Manage the ambient air quality by maintaining emission standards.

CO4:Gets successful employment in organizations working for the protection of environmental.

CO5: Design air pollution control equipments for industries and other polluting sources.

UNIT I

Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Measurement of Pollution Classifications – Natural and Artificial –Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution- stationary and mobile sources.

UNIT II

Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, and Ozone Holes-Effects of art treasures.

UNIT III

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, Reverse Flow Cyclones, Fabric filters – Bag House, Dry and Wet scrubbers, Electrostatic precipitators.

UNIT IV

General Methods of Control of NO_2 and SO_2 emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

UNIT – V

Ambient Air Quality Management – Monitoring of SPM, SO, NO and CO Stack Monitoring for the Flue gases –Micro meterological monitoring Emission Standards.

TEXT BOOKS:

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air pollution and control by KVSG Murali Krishna.

REFERENCE BOOKS:

1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution by Wark and Warner – Harper & Row, New York.

CYBER LAWS (OPEN ELECTIVE)

Subject Code: 13OE4002 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To identify the emerging Cyber law trends
- To create more awareness about the newly emerging kinds of cybercrimes
- To identify the areas in cyber crimes where Cyber law needs to be further evolved
- To identify the impact of Cyber Law on Real World
- To identify the importance of cyber law and its professionals.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Have comprehensive information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources.

CO2: Understand, analyze and work on activities of fraud prevention, monitoring, investigation, reporting.

CO3: Differentiate among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.

CO4: Have knowledge of cyber law and ethics.

CO5: Evaluate the interaction and relative impact of human factors, processes and Technology in cyber law infrastructures.

UNIT- I

The IT Act, 2000: A Critique: Crimes in this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce?, Forgetting the Line between Cognizable and Non- Cognizable Officers, Arrest for "About to Commit" an Offence Under the IT Act, A Tribute to Darco, Arrest, But No Punishment.

UNIT- II

Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud and Cyber Cheating, Virus on Internet Deformation, Harassment and E-mail Abuse

UNIT- III

DE-Commerce Taxation - Real Problems in the Virtual World: A Tug of War on the Concept of Permanent Establishment, Finding the PE in Cross Border E-Commerce, Source versus residence and classification between Business Income and Royalty, The impact of the internet on Customs duties, Taxation policies in India.

UNIT- IV

Digital Signatures, Certifying Authorities and E-Governance: Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature compromise, E-Governance in the India. A Warming to Babudom

UNIT-V

Protection of Cyber Consumers in India: Are Cyber Consumers Covered under the Consumer Protection, Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices

TEXT BOOKS:

1. Cyber Law Simplified, Vivek Sood, Tata McGraw-Hill
2. Cyber Law. Texts & Cases, South-Western's Special Topics Collections

REFERENCE BOOKS:

1. Law Relating to Computers Internet & E-Commerce By Nandan Kamath , 2nd Edition, Niversal Law Publishing Co. Pvt. Ltd.
2. Cyber Law in India by Farooq Ahmad – Pioneer Books.
3. Information Technology Law and Practice by Vakul Sharma – Universal Law Publishing Co. Pvt. Ltd. The Indian Cyber Law by Suresh T Vishwanathan – Bharat Law house New Delhi.
4. Hand book of Cyber & E-commerce Laws by P.M. Bakshi & R.K.Suri – Bharat Law house, New Delhi.
5. Guide to Cyber Laws by Rodney D. Ryder – Wadhwa and Company Nagpur. The Information Technology Act,2000 – Bare Act – Professional Book Publishers – New Delhi

ENTREPRENEURIAL DEVELOPMENT (OPEN ELECTIVE)

Subject Code: 13OE4003 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- The objective of this course is to expose the students to the subject of entrepreneurial development, so as to prepare them to establish a new enterprise and effectively manage the enterprise.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.

CO2: Understanding Entrepreneurship Development programmes in INDIA and contents for training for Entrepreneurial competencies.

CO3: Create appropriate business model and develop well presented business plan that is feasible for the student.

CO4: Understanding how to manage effectively the selected business.

UNIT 1

Entrepreneur and Entrepreneurship : Meaning of Business and components of Business. Concept of Entrepreneur, characteristics of an Entrepreneur, distinguish between an Entrepreneur and manager, functions of an Entrepreneur, types of Entrepreneurs, Intrapreneur. Concept of Entrepreneurship, women entrepreneurship and Rural entrepreneurship. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

UNIT 2

Entrepreneurship Development in India : Nature and development of Entrepreneurship in India - emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and Course Objectives: of EDPs, course contents, phases and evaluation of EDPs for existing and new entrepreneurs . Institutions for EDP - NIESBUD, EDII, NAYE,TCOs, MSMEDI,DICs, commercial Banks, Universities and Engineering colleges..

UNIT 3

Creating and starting the venture: types of start ups. Meaning of a project. Project Identification- Sources of new Ideas, methods of generating ideas, creative problem solving, opportunity recognition. Project selection - meaning of project report (business plan), Formulation of a project report, project appraisal by economic analysis, financial Analysis, market analysis, technical Feasibility, managerial competence. Project implementation. preparation of sample project report of any one product and service.

UNIT 4

Government and Institutional support to Entrepreneurs: MSME Development Act-2006. Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, Institutional finance – sources of short term and long term capital including Venture capital. Role of IDBI, SIDBI, NSIC, , EXIM Bank and commercial Banks, APSFC, etc. AP Industrial policy (2015-20) - incentives and subsides, industrial estates, AP Skill Development Corporation.

UNIT 5

Managing the venture: Types of Ownership. Concepts of working capital management, Marketing management, Human Resource management and TQM. Problems and prospects of MSME in India. Profile of entrepreneurs.

Text Books:

1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. S.S.Khanka: Entrepreneurial Development, S.Chand & Company Ltd New Delhi 2009
3. Dr.C.B.Gupta and Dr.S.S.Khanka Entrepreneurship and Small Business Management: Sultan Chand & Sons:,2010
4. Narayana Reddy: Entrepreneurship, Cengage learning, New Delhi, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New delhi,2010
6. Vasat Desai: The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2011

Reference Books:

1. Robert D Hisrich, Michel P Peters, Dean A Sheperd: Entrepreneurship, Tata Mc Graw Hill Education Private ltd.
2. Hisrich: Entrepreneurship, TMH, New Delhi,2009
3. Prasanna Chandra: Projects, TMH, New Delhi.
4. K.Nagarajan: Project Management, New Age International, New Delhi,2010

INDUSTRIAL SAFETY & ENVIRONMENT (OPEN ELECTIVE)

Subject Code: 13OE4004 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To familiarize the student with fundamentals principals of safety management
- To impart knowledge on different type of industrial hazards
- To enable the student to know the various industrial safety acts
- To understand the environmental safety

Course Outcomes:

At the end of the course the student will be able to:
CO1: Attain the basic fundamentals safety management
CO2: Understand the safety various industrial safety acts
CO3: Acquire basic knowledge of different type of industrial hazards
CO4: Understand the concepts of environmental safety

UNIT –I

Principles of Safety Management Concepts and techniques, safety audit- introduction, accident investigation and reporting, safety performance monitoring, safety education and training

UNIT –II

Environmental Safety Air pollution, water pollution, hazardous waste management, environmental measurement and control, pollution control in process industries

UNIT-III

Occupational health and industrial hygiene; physical hazards, chemical hazards, biological and ergonomical hazards, occupational physiology

UNIT –IV

Industrial safety, health and environment acts; factories act– 1948, environment act– 1986, manufacture, storage and import of hazardous chemical rules 1989

UNIT – V

International acts and standards, other acts and rules (Indian boiler act 1923, static and mobile pressure vessel rules (smpv), motor vehicle rules)

TEXT BOOKS:

1. Krishnan N.V. “Safety Management in Industry” Jaico Publishing House, Bombay, 1997.
2. Rao, CS, “Environmental pollution engineering:, Wiley Eastern Limited, New Delhi, 1992

REFERENCES BOOKS:

1. S.P.Mahajan, "Pollution control in process industries", Tata McGraw Hill Publishing Company, New Delhi, 1993.
2. Hand book of "Occupational Safety and Health", National Safety Council, Chicago, 1982
3. The Factories Act 1948, Madras Book Agency, Chennai, 2000
4. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt. Ltd. New Delhi.
5. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India) Pvt. Ltd. New Delhi.

MICRO ELECTRO MECHANICAL SYSTEMS (OPEN ELECTIVE)

Subject Code: 13OE4005 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To understand various MEMS fabrications processes including additive, subtractive, patterning, material modification processes and mechanical steps.
- To understand workings of MEMS mechanical and thermal sensors and actuators
- To understand mechanisms of MEMS magnetic sensors and actuators and Micro-fluidic devices
- To understand mechanisms of MEMS optical and RF devices.
- To be exposed to MEMS simulation softwares, Multiscale simulations, CNT and NEMS.

Course Outcomes:

At the end of the course student will be able to

CO1: Understand various MEMS fabrications processes including additive, subtractive, patterning, material modification processes and mechanical steps.

CO2: Understand workings of MEMS mechanical and thermal sensors and actuators

CO3: Understand mechanisms of MEMS magnetic sensors and actuators and Micro-fluidic devices

CO4: Understand mechanisms of MEMS optical and RF devices.

CO5: Be exposed to MEMS simulation software's, Multiscale simulations, CNT and NEMS.

UNIT I

MICRO-MACHINING PROCESSES

Additive Processes – Spin coating, Evaporation, Sputtering, PVD, CVD, PECVD, Thermal oxidation

Subtractive Processes – Plasma etching, Reactive ion etching, DRIE etching, Wet chemical etching

Pattering Processes – Photolithography, X-ray Lithography, LIGA

Material Modification Processes – Ion implantation doping, Diffusion doping, Thermal annealing

Mechanical Steps – Polishing, Wafer bonding, Wafer dicing, Wire bonding, Chip packaging

UNIT II

MECHANICAL SENSORS AND ACTUATORS

Principles of mechanical sensing and actuation – beam, plate, capacitive, piezo-electric. Strain measurement, Pressure measurement, Flow measurement, Gyroscopes. Specialized Actuators – Shear-mode piezo, Gripping piezo, Inchworm technology.

THERMAL SENSORS AND ACTUATORS

Thermal transduction phenomena - Thermo-electric, Thermo-resistive, Pryo-electric effects. Micro-machined thermo-couple probe, Peltier effect heat pump. Thermal flow sensors, Micro-hot plate gas sensors, Thermo-vessels. Pyro-electricity, Shape memory alloys, Electro-

thermal actuator, Thermally activated MEMS relay, Micro-spring thermal actuator, Data storage cantilever.

UNIT III

MAGNETIC SENSORS AND ACTUATORS

Magnetic properties of materials, Presence and detection of large objects, Magneto-restrictive sensor, Hall effect sensor, Magneto-diode, Magneto-transistor, MEMS magnetic sensor, Pressure sensor utilizing MOKE, MagMEMS actuators, Optical switches, Bi-directional micro-actuator, Feedback circuit integrated magnetic actuator, Large force reluctance actuator, Magnetic probe based storage device.

MICRO-FLUIDICS

Introduction, Properties of fluids, Micro-fluidic design considerations. Fluid actuation methods – Di-electro-phoresis, Electro-wetting, Electro-thermal, Thermo-capillary, Electro-osmosis, Opto-electro-wetting. Tuning of fiber optic cables using micro-fluidics, Micro-fluidic channel, Dispenser, Needle, Molecular gate, Micro-pump,

UNIT IV

OPTICAL SENSORS AND ACTUATORS

Properties of light, Light modulators, Beam splitter, Micro-lens, Micro-mirror, Optical switch. Digital Micro Device (DMD) using Digital Light Processing (DLP) technology. Diffraction grating, Grating light valve, Waveguide and tuning.

RF MEMS

Introduction to RF Communication and RF MEMS, MEMS inductors, Varactors, Tuner/filter, resonator, MEMS switches, Phase shifter.

UNIT V

MEMS SIMULATIONS

Atomistic to Continuum theory, Multiscale concept, Multiscale methods. Softwares - Ansoft Designer, HFSS, DS/MEMS and CA/MEMS, FEMPRO, ANSYS Multiphysics, SUGAR.

NEMS

Nanotechnology Materials, Carbon Nanotubes (CNT) – Development, Applications, Properties, molecular Machine Components, Introduction to NEMS.

TEXT BOOKS:

1. MEMS, Nitaigour Premchand Mahalik, Tata McGraw Hill Pub.

REFERENCE BOOKS:

1. Foundations of MEMS, Chang Liu, Pearson Pub.
2. MEMS & Microsystems – Design and Manufacture, Tai-Ran Hsu, McGraw Hill Pub.

OPTIMIZATION TECHNIQUES (OPEN ELECTIVE)

Subject Code: 13OE4006 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To be able to formulate linear or nonlinear optimization problems as a solution for industrial problems.
- To be able to solve various kinds linear and nonlinear, single and multiple variable, unconstrained and constrained optimization problems using standard optimization algorithms.

Course Outcomes:

At the end of the course student will be able to

CO1: Solve linear multivariable optimization using linear programming and perform Sensitivity analysis.

CO2: Solve single-variable, non-linear, unconstrained optimization problems

CO3: Solve geometric programming optimization problems using standard techniques for each case.

UNIT – I

Introduction to Classical Optimization Techniques:

Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions

UNIT – II

Linear programming: Two-phase simplex method, Big-M method, duality, interpretation, applications.

UNIT - III

Assignment problem: Hungarian's algorithm, Degeneracy, applications, unbalanced problems, traveling salesman problem.

UNIT - IV

One dimensional Optimization methods:

Elimination Methods: - Fibonacci, Golden Section. Interpolation Methods: - Quadratic, Cubic. Direct Root Methods: - Newton, Quasi-Newton, Secant Methods. Gradient of a function, steepest descent method.

UNIT - V

GEOMETRIC PROGRAMMING: Polynomials – arithmetic - geometric inequality – unconstrained G.P- constrained G.P

TEXT BOOKS:

1. Engineering Optimization, Theory and Applications, S.S. Rao, New Age International.
2. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers

REFERENCES BOOKS:

1. Optimization Techniques, Theory and Practice, M.C.Joshi, K.M.Moudgalya, Narosa Pub.
2. Engineering Optimization, A Ravindran, K M Ragsdell, G V Reklaitis

RENEWABLE ENERGY (OPEN ELECTIVE)

Subject Code: 13OE4007 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To outline the concept regarding the physics of the Sun.
- To outline the concept regarding the collection of solar energy and storage of solar energy.
- To outline the concept regarding different types of wind mills and different types of biogas digesters.
- To outline the concept regarding geothermal energy conversion.
- To outline the concept regarding direct energy conversion.

Course Outcomes:

At the end of the course student will be able to

CO1: Define different kinds of solar radiation.
CO2: Utilize different methods of collection of solar energy and storage of solar energy.
CO3: Classify different types of wind mills and biogas digesters.
CO4: Classify different types of geothermal energy sources and utilize different types of extracting techniques.
CO5: Distinguish different kinds of direct energy conversion techniques.

UNIT – I

PRINCIPLES OF SOLAR RADIATION:

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II

SOLAR ENERGY COLLECTION, STORGAE AND APPLICATIONS

Flat plate and concentrating collectors, classification of concentrating collectors, orientation, advanced collectors. Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications - solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III

WIND AND BIOMASS ENERGY:

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria. Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-IV

GEOTHERMAL AND OCEAN ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V

DIRECT ENERGY CONVERSION:

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion. Fuel cells, principles, faraday's law's, selection of fuels and operating conditions.

TEXT BOOKS:

1. Non-Conventional Energy Sources / G.D. Rai
2. Renewable Energy Technologies / Ramesh & Kumar / Narosa

REFERENCE BOOKS:

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

ADVANCED MATERIALS (OPEN ELECTIVE)

Subject Code: 13OE4008 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To know different types of composite materials.
- To learn different manufacturing methods of the composite materials.
- Distinguish between the properties and uses of different reinforcement fibres.
- Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
- To know about the nanomaterials and nanotechnology.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Understand the need and explain different types of composite materials.
CO2: Summarize the various methods for manufacturing of the composite materials.
CO3: Distinguish between the properties and uses of different reinforcement fibres.
CO4: Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
CO5: Outline the evolution, history, applications and impact of nanotechnology.

UNIT-I

Introduction to Composite Materials and Manufacturing processes: Introduction, Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon-Carbon Composites, Fiber- Reinforced Composites.
Manufacturing Methods: Autoclave, tape production, moulding methods, filament winding, manual layup, pultrusion, RTM.

UNIT-II

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Metal Matrix and Ceramic Matrix Composites: Manufacturing of ceramic matrix & metal matrix composites and their applications, stress strain relations for MMC and CMC.

UNIT-III

Smart materials

Shape memory alloys, Piezoelectric materials, Electro-rheological fluid, Magneto-rheological fluid

UNIT-IV

Biomaterials

Property requirement, Concept of biocompatibility, Cell-material interaction and body response to foreign materials, important biometallic alloys, Ni-Ti alloy, Co-Cr-Mo alloys

UNIT-V

Nano materials & technology

Definition, Types of nanomaterials including carbon nanotubes and nanocomposits, Methods for creating nano structures, Processes for producing ultrafine powders - physical synthesis and chemical synthesis, Physical and mechanical properties and their applications

TEXTBOOKS:

I. Nano material by A.K. Bandyopadyay, New age 'publishers
2. Material science and Technology- Cahan
3. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press
4. The Science and Engineering of Materials-D. R. Askeland and P. P. Phule - Thomson Publication
5. Advances in Material Science-R. K. Dogra and A. K. Sharma
6. Engineering Materials and Applications-R. A. Flinn and P. K. Trojan

REFERENCE BOOKS:

1. R. M. Jones, Mechanics of Composite Materials, Me Graw Hill Company, New York, 1975.
2. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980

TOTAL QUALITY MANAGEMENT (OPEN ELECTIVE)

Subject Code: 13OE4009 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

Course Outcomes:

At the end of the course student will be able to

CO1: Develop an understanding on quality management philosophies and frameworks.

CO2: Understand the fundamental principles of total quality management.

CO3: Choose approximate statistical techniques for improving processes.

CO4: Develop in-depth knowledge on various tools and techniques of quality management.

CO5: Know what cultural transformation is necessary for successful implementation of total quality practices with his/her organization.

UNIT - I

INTRODUCTION: Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT - II

TQM PRINCIPLES : Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure.

UNIT - III

STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY: Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning, significance and measurement – Six sigma concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve. Total productive maintenance (TMP)– relevance to TQM, Terotechnology. Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

UNIT - IV

TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools. Seven new management tools. Bench marking and POKA YOKE.

UNIT - V

QUALITY SYSTEMS: Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 - Concept, Requirements and Benefits.

TEXT BOOKS:

1. Dale H.Besterfield et al, Total Quality Management, Third edition, Pearson Education (First Indian Reprints 2004).
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

REFERENCES BOOKS:

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.
3. Oakland.J.S. "Total Quality Management Butterworth - Hcinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management - Concepts and Tasks, New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.

MICROWAVE ENGINEERING LAB

Subject Code: 13EC4112 **External Marks: 50**
Credits: 2 **Internal Marks: 25**

Course Objectives:

- To study the microwave bench-setup.
- To measure different parameters of the microwave devices
- To analyze various parameters of Waveguide Components
- To facilitate the student to become familiar with active & passive microwave devices & components used in Microwave communication systems.
- To estimate the power measurements of RF Components such as directional Couplers

Course Outcomes:

At the end of the course student will be able to:
CO1: Draw the characteristics of microwave devices.
CO2: Determine scattering parameters of various microwave components
CO3: Compute the various microwave measurements.
CO4: Analyze various parameters of Waveguide Components
CO5: To measure the power of RF Components such as directional Couplers

List of Experiments:

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Frequency Measurement.
8. Waveguide parameters measurement.
9. Scattering parameters of Circulator.
10. Scattering parameters of Magic Tee.

VLSI LAB

Subject Code: 13EC4113 **External Marks: 50**
Credits: 3 **Internal Marks: 25**

Course Objectives:

- To test the operation of logic gates
- To evaluate operation of basic adders
- To interpret the operation of decoders
- To test the operation of sequential circuits

Course Out comes:

At the end of the course student will be able to:
CO1: Verify the outputs of combinational circuits using Xilinx software
CO2: Analyze the outputs of multiplexer using Xilinx software
CO3: Develop sequential circuit using Xilinx software
CO4: Verify the outputs of code generators

The students are required to synthesize the following experiments using Xilinx software

1) Logic gates
2) Full adder
3) 2 to 4 and 3 to 8 decoder
4) 2-bit comparator
5) SR & D Flip-flop
6) JK & T Flip-flop
7) 8 to 1 multiplexer and 1 to 8 demultiplexer
8) 8 to 3 encoder
9) 3- bit parity generator
10) 3-bit binary to gray code generator

EMPLOYABILITY SKILLS

Subject Code: 13HS4203 **External Marks:**
Credits: 2 **Internal Marks: 75**

CELLULAR AND MOBILE COMMUNICATIONS

Subject Code: 13EC4036 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To provide the fundamentals of cellular mobile communications those are important to any mobile communication system.
- To explain different frequency management and channel assignment techniques. This course also deals with handoff, dropped calls and cell splitting.
- To describe cell coverage for signal and traffic, signal reflections in various terrains, various cell sites and mobile antennas and their analysis.
- To introduce cellular mobile radio systems, performance criteria, design and operations of cellular systems. It covers various types of interferences in mobile radio environment.
- To provide the student with an understanding of advanced multiple access techniques and digital cellular systems (GSM, TDMA, CDMA, SDMA, and CSMA).

Course Outcomes:
At the end of the course student will be able to
CO1: Identify the limitations of conventional mobile telephone system, Understand the operation of cellular system.
CO2: Analyze the concept of frequency Reuse channels, Deduce the Co-channel interference reduction factor.
CO3: Design of Antenna system to reduce Co-channel interference.
CO4: Analyze about cell site and mobile antennas, frequency management and channel assignment strategies.
CO5: Define Handoff, Distinguish types of handoffs and evaluation of dropped call rates.

UNIT I
CELLULAR MOBILE SYSTEMS: Introduction to Cellular and non-cellular Mobile System, Mobility versus non mobility, Performance criteria, Generation of cellular Systems (1G-4G), Types of cells, Operation of cellular systems.
ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN: Types of Interference reduction factors, Desired C/I cases in an Omni directional Antenna system, Cell splitting and its types.

UNIT II
MOBILE SIGNAL PROPAGATION: Types of propagation models, Fading in propagation, Signal reflections in flat and hilly terrains, Mobile propagation over different surfaces.
INTERFERENCE: Co-Channel Interference, Non-co-channel interference, Measurement methods for Interferences.

UNIT III
CELL SITE ANTENNAS: Omni and Non-Omni directional antennas, Directional antennas, Diversity antenna types, Types of cell site antennas, Low and High gain antennas.

HANDOFF MECHANISM: Dropped call rates, Types of handoff initiation, and Types of handoff, and Vehicle locating methods.

UNIT IV

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering, Grouping and Paging in channels, Channel assignments to cell sites and mobile units, Channel sharing and borrowing, Types of channel assignment.

UNIT V

DIGITAL CELLULAR DATA ACCESS: GSM architecture, GSM channels, TDMA, CDMA, SDMA, Packet Radio, Pure ALOHA, Slotted ALOHA, and CSMA.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
3. G. Sasibhushana Rao, "Mobile Cellular Communications", Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
2. Wireless Communication and Networking – Jon W. Mark and WeihuaZhqung, PHI, 2005.
3. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

OPTICAL COMMUNICATIONS & NETWORKS
(ELECTIVE – III)

Subject Code: 13EC4037 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To define the basic concepts and operating principles of single mode fibers and multi mode fibers.
- To develop an essential understanding of optical sources and optical detectors.
- To generalize the origin of loss and causes of various dispersion in optical fibers.
- To know the design considerations of fiber optic system.
- To explain the different components of fiber optic networks.

Course Outcomes:

At the end of the course student will be able to
CO1: Generalize the basic operating principles of single mode and multimode fibers.
CO2: Analyze and compare optical sources and detectors from both physical and system point of view.
CO3: Define the parameters of optical fibers and interpret the various optical losses in optical fiber.
CO4: Estimate power budget for an optical link
CO5: Describe the different components of optical fiber networks.

UNIT I
Overview of optical fiber communication - The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Modes, V number, Mode coupling, Step Index fibers, Graded Index fibers.
Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index. Fiber materials, Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses.

UNIT II
Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency.
Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparision of Photo detectors.

UNIT III
Dispersion: Information capacity determination, Group delay, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening, Power launching into fiber.

UNIT IV

Optical receiver operation: Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error.

Optical system design: Considerations, Multiplexing. Point-to- point links: System considerations, Link power budget, Rise time budget.

UNIT V

Components of fiber optic Networks: Overview of fiber optic networks, Transreceiver, semiconductors optical amplifiers, couplers/splicers, wavelength division multiplexers and de-multiplexers, filters, isolators and optical switches.

Fiber Optic Networks: Basic networks, WDM Networks, optical CDMA.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

RERFERENCE BOOKS :

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.
5. Fiber Optics Communications – Harold Kolimbiris (Pearson Education Asia)

ADVANCED SIGNAL PROCESSING
(ELECTIVE – III)

Subject Code: 13EC4038 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To understand time frequency transformations
- To familiarize sample rate conversions in multi rate signal processing
- To design digital filters for given specification
- To understand various power spectral estimation methods

Course Outcomes:

At the end of the course the student will be able to:
CO1: Define the properties of DFT and recall the importance of FFT algorithm.
CO2: Describe the concept of multi rate signal processing and sample rate conversion.
CO3: Convert the filter design specification into filter parameters.
CO4: Define parametric power spectral analysis methods of signals.
CO5: Define non parametric power spectral analysis methods of signals.

UNIT I
Discrete Fourier Transform:
Properties of DFT, Linear filtering methods based on the DFT, overlap-save, and overlap - add methods, frequency analysis of signals, Radix-2 FFT and Split- Radix FFT algorithms.

UNIT II
Multirate Signal Processing:
Basic structures for sampling rate conversion, Decimators and Interpolators; Multistage design of interpolators and decimators; Poly phase decomposition and FIR structures; Computationally efficient sampling rate converters; Arbitrary sampling rate converters based on interpolation algorithms: Lagrange interpolation, Spline interpolation.

UNIT III
Design of digital filter based on Least Square Methods:
The least square (Direct method), Pade Approximation, Least Square design Methods, Prony's Method, FIR Least Square Inverse wiener filter, and Design of IIR filters in frequency Domain.

UNIT IV
Non parametric methods of Power Spectral Estimation:
Estimation of Spectra from Finite Duration Observations of a signal, the Periodogram, Use DFT in power Spectral Estimation, Bartlett, Welch and Blackman, Tukey methods, Comparison of performance of Non-Parametric Power Spectrum Estimation Methods

UNIT V

Parametric methods of Power Spectral Estimation:

Parametric Methods for power spectrum estimation, Relationship between Auto-Correlation and Model Parameters, AR (Auto-Regressive) Process and Linear Prediction, Yule-Walker, Burg and Un-constrained Least Squares Methods, Sequential Estimation, Moving Average(MA) and ARMA Models.

Text Books:

1. Proakis JG and Manolakis DG, Digital Signal Processing Principles, Algorithms and Application, PHI.
2. Openheim AV & Schafer RW, Discrete Time Signal Processing PHI.

Reference Books:

1. Samuel D Stearns, “Digital Signal Processing with examples in Matlab”. CRC Press.
2. ES Gopi. “Algorithm collections for Digital Signal Processing Applications using Matlab”, Springer.
3. Taan S.Elali, “Discrete Systems and Digital Signal Processing with Matlab”, CRC Press, 2005.
4. “Multirate systems and filter banks”- P.P.Vaidyanadhan

ADVANCED COMPUTER ARCHITECTURE
(ELECTIVE – III)

Subject Code: 13EC4039 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To get the knowledge on system performance dependence attributes and calculation of system throughput.
- To learn memory hierarchy concepts and how to improve the performance of cache memory.
- Understand how the coherence, inclusion and locality properties are satisfied in memory hierarchy.
- Understand the linear and nonlinear scheduling processes in pipelining.
- Distinguish the design of Shared Memory MIMD and Distributed Memory MIMD machines
- Understand the message passing system to avoiding the inconsistency in multiprocessors.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Infer knowledge on Hardware and System Design concepts.
CO2: Learn about memory hierarchy and performance of cache memory.
CO3: Design E-cube routing in Hypercube computers and X-Y routing in 2-D mesh.
CO4: Justify identify permissible latencies and forbidden latencies for the given non-linear pipeline.
CO5: Distinguish between RISC and CISC architectures.
CO6: Design the input-output connections in an Omega Network using perfect shuffle method.

UNIT – I

Parallel Computer: State of computing, Elements of modern computer, Flynn's classification of parallel processors, System attributes to performance, Multiprocessors and Multicomputer, Shared memory multiprocessors, Distributed memory multiprocessors.

UNIT – II

Memory Hierarchy Design: Basic memory hierarchy, Optimization of cache performance, Small and simple first level cache to reduce hit time and power, Way prediction to reduce hit time, Pipelined cache access to increase cache band width, Non-blocking cache to increase cache band width.

UNIT – III

Linear and Non-Linear Pipeline Processors: Asynchronous and synchronous models, Clocking and timing control, Speedup, Efficiency and Throughput, Non-Linear Pipeline Processors-Reservation and latency analysis problems, Collision free scheduling problems, instruction execution phases.

UNIT – IV

Multiprocessors and Multivector Computers: Inter connection structure-Crossbar switch and multiport memory, Multistage and combining network routing, Hot-spot problem, Applications and drawbacks, Multivector computers-Vector processing principles, Vector instruction types, Vector access memory schemes.

UNIT – V

Cache coherence and Message Passing Mechanisms: Cache coherence problems-Two protocol approach, Snoopy protocol, Directory based protocol, Message Passing Mechanisms-Message routing schemes, Deadlock virtual channels, Flow control strategies, Multicast routing algorithm.

TEXT BOOK:

1. "Advanced Computer Architecture-parallelism, Scalability, Programmability" Kai Hwang and Naresh Jotwani, McGraw-Hill Publications.
2. "Computer Architecture A quantitative approach" 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann.

REFERENCE BOOKS:

1. "Computer Architecture and parallel Processing" Kai Hwang and A.Briggs International Edition McGraw-Hill.
2. Advanced Computer Architecture, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson publications.

MIXED SIGNAL IC DESIGN (ELECTIVE – III)

Subject Code: 13EC4040 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To introduce circuit design concepts for basic building blocks used in mixed signal integrated circuit designs.
- To provide skills to design mixed- signal integrated circuits with these building blocks.
- To demonstrate the fundamentals of data converters

Course Outcomes:

At the end of the course the student will be able to
CO1: Learn analysis of switched capacitor circuits.
CO2: Know dynamics of PLL blocks.
CO3: Demonstrate the fundamentals of data converters.
CO4: Classify data converters.
CO5: Compare different data converters

UNIT –I
Switched Capacitor Circuits: Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing.

UNIT –II
Phased Lock Loop (PLL): Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications

UNIT –III
Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT –IV
Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT –V
Oversampling Converters: Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edition, 2013

REFERENCE BOOKS:

1. CMOS Integrated Analog-to- Digital and Digital-to-Analog converters-Rudy Van De Plassche, Kluwer Academic Publishers, 2003
2. Understanding Delta-Sigma Data converters-Richard Schreier, Wiley Interscience, 2005.
3. CMOS Mixed-Signal Circuit Design - R. Jacob Baker CMOS Analog Integrated Circuit Design

OPERATING SYSTEMS
(ELECTIVE – III)

Subject Code: 13EC4041 **Credits: 3**
Internal Marks: 30 **External Marks: 70**

Course Objectives:

- Understand structures and history of operating systems
- Understand process management concepts including scheduling, synchronization and deadlocks.
- Know memory management including virtual memory.
- Summarize the full range of considerations in the design of file systems.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Describe the role of operating system and explain the different structures of operating system

CO2: Explain process management and compare the performance of various process scheduling algorithms.

CO3: Propose solutions for achieving process synchronization

CO4: State the conditions that lead to deadlock and apply deadlock prevention, detection, avoidance algorithms

CO5: Discuss different memory management techniques, file system design tradeoffs.

CO6: Familiarize with disk scheduling, device drivers, protection and security mechanisms

UNIT I:

Basics: Operating System Functionalities, Types of Operating Systems.

Process Management: Process concept-Process Scheduling, Uniprocessor scheduling algorithms, scheduling Algorithms evaluation, Multi Thread programming model.

UNIT II:

Process Synchronization - Peterson's Solution, Hardware Support to Process Synchronization, Semaphores, Critical Regions, Monitors.

Principles of deadlock-Deadlock prevention, deadlock avoidance and Deadlock Detection and Recovery - Bankers Algorithm.

UNIT III:

Memory Management: contiguous memory allocation, paging, Segmentation and space allocation, Basics of linking and loading, Demand Paging, Page replacement algorithms, Analysis of page allocation policies - Working Set.

UNIT IV:

File System Interface: the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation: File system structure, file system implementation, directory implementation, allocation methods, free-space management.

UNIT V:

I/O System: Disk Scheduling, Device drivers - block and character devices, streams, Character and Block device switch tables

Protection and Security - Accessibility and Capability Lists

TEXT BOOKS:

1. Operating System Concepts - Operating System Concepts, Sixth Edition, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, John Wiley & Sons Inc.
2. Operating Systems - Operating System: Internals and Design Principles (4th edition), William Stallings

REFERENCE BOOKS:

1. Modern Operating Systems- Andrew S Tanenbaum, Prentice Hall
2. Operating Systems - System Programming and Operating Systmes D M Dhamdhere, Tata Mc Graw Hill
3. Operating Systems - Operating Systems: A Modern Perspective, 2/E, Gary Nutt, Addison Wesley
4. Operating Systems - Operating Systems, Achyut S Godbole, Tata Mc Graw Hill

GLOBAL POSITIONING SYSTEM AND ITS APPLICATIONS (ELECTIVE – IV)

Subject Code: 13EC4042 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Extrapolate the history and basics of GPS
- Analyze the various segments and signal structure of GPS
- Infer the coordinate system of GPS constellation
- Determine the navigation solution for precise position
- Measure the GPS errors that are effecting the user position

Course Outcomes:

At the end of the course student will be able to:
CO1: Summarize the working principle of GPS and its history
CO2: Demonstrate the operation of all segments and utilize various codes
CO3: Explain how satellites are arranged in space
CO4: Develop new navigation solutions for determining accurate user position
CO5: Design a navigation solution by minimizing the GPS errors

UNIT I

Introduction to Global Navigation Satellite Systems(GNSSs): The History of GPS, The Evolution of GPS, Development of NAVSTAR GPS, GPS working principle, Trilateration, Determining the receiver position in 2D or XY Plane, Determining the receiver position in 3D or X-Y-Z Plane.

UNIT II

GPS Satellite constellation and Signals: GPS system segments, Space segment, Control segment, User segment, GPS Signals, Pseudorandom noise (PRN) code, C/A code , P code Navigation data, Signal structure of GPS. Anti spoofing (AS), selective availability.

UNIT III

Coordinate Systems: Geoid, Ellipsoid, Geodetic and Geo centric coordinate systems, ECEF coordinates, world geodetic 1984 (WGS 84) system, Conversion between Cartesian and geodetic coordinate frame GPS time.

UNIT IV

GPS orbits and satellite position determination: GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination, least squares method.

UNIT V

GPS Errors: GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

Text books :

1. G S Rao, Global Navigation Satellite Systems, McGraw-Hill Publications, New Delhi, 2010

Reference Books :

1. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice', Springer – Wien, New York (2001).
2. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons (2001).

DATA WAREHOUSING & DATA MINING
(ELECTIVE – IV)

Subject Code: 13EC4043 **Credits: 3**
Internal Marks: 30 **External Marks: 70**

Course Objectives:

- Introduce basic concepts, principles, major techniques and algorithms in data Warehousing & data mining. These include concepts and techniques for data reprocessing, OLAP, association rule mining, data classification, and data clustering.
- Discuss application, emerging areas in data mining and the role of it in society.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Recognize types of data, data quality, need of preprocessing and different measures of Similarity and dissimilarity.

CO2: Differentiate between methods for modeling multidimensional data, design and implement Data warehouse.

CO3: Explain in detail major techniques and algorithms involved in data mining, including techniques and algorithms for data preprocessing, association rule mining, data classification, and data clustering.

CO4: Evaluate the performance of a classifies.

CO5: Compare and contrast different clustering algorithms.

CO6: Apply data mining algorithms and techniques adaptively to real world problem solving.

UNIT – I

Introduction to Data Mining: What is data mining, motivating challenges, origins of data mining, data mining tasks, Types of Data-attributes and measurements, types of data sets, Data Quality (Tan)

Data Preprocessing, Measures of similarity and Dissimilarity: Basics, similarity and dissimilarity between simple attributes, dissimilarities between data objects, similarities between data objects, examples of proximity measures: similarity measures for binary data, Jaccard coefficient, Cosine similarity, Extended Jaccard coefficient, correlation, Exploring data: Data set, summary statistics (Tan).

UNIT – II

Data Warehouse and OLAP Technology: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining (Han).

Concept Description - Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes. (Han).

UNIT – III

Association analysis problem definition, Frequent item–set generation. The apriori principle, frequent item set generation in the Apriori algorithm, candidate generation and pruning, support counting (excluding support counting using a Hash tree), Rule generation compact representation of frequent item sets, FP–Growth algorithm (Tan)

UNIT – IV

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Increasing the Accuracy (Han).

UNIT – V

Cluster Analysis:

Overview- types of clustering basic K–means, K-means – additional issues, bisecting k-means k-means and different types of clusters, strengths and weaknesses, k-means as an optimization problem.

Agglomerative hierarchical clustering, basic agglomerative hierarchical clustering algorithm, specific techniques, DBSCAN: traditional density: center–based approach, strength and weaknesses (Tan)

TEXT BOOKS:

1. Introduction to Data Mining, Pang Ning Tan, Michael Steinbach, Vipin Kumar, Pearson (Tan).
2. Data Mining Concepts and Techniques, 3/e, Jiawei Han & Micheline Kamber, Elsevier (Han).

REFERENCE BOOKS:

1. Introduction to Data Mining with Case Studies, 2/e, GK Gupta, PHI
2. Data Mining: Introductory and Advanced Topics, Dunham, Sridhar, Pearson Data Warehousing, Data Mining and OLAP, Alex Berson, Stephen Smith, TMH

EMBEDDED & REAL TIME OPERATING SYSTEMS
(ELECTIVE – IV)

Subject Code: 13EC4044 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Understand general overview of embedded Systems and process.
- Learn about state machine and different process models.
- Gain the ability to make intelligent choices for selection of different communication interfaces
- Understand various embedded and real-time concept.
- Study the overview of different real-time operating systems.

Course Outcomes:
At the end of the course student will be able to
CO1: Describe the basics of an embedded system.
CO2: Explain the state machine models &concurrent process models.
CO3: Explain the concepts of different communication interfaces.
CO4: Explain the various real time operating system concepts.
CO5: Describe the Linux & real-time operating system.

UNIT – I
INTRODUCTION:
Embedded systems over view, design challenges, processor technology, Design technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic(RT level), custom purpose processor design(RT -level), optimizing custom single purpose processors.
GENERAL PURPOSE PROCESSORS:
Basic architecture, operations, programmer's view, development environment, Application specific Instruction –Set processors (ASIPs)-Micro controllers and Digital signal processors.

UNIT – II
STATE MACHINE AND CONCURRENT PROCESS MODELS:
Introduction, models Vs Languages, finite state machines with data path model(FSMD),using state machines, program state machine model(PSM, concurrent process model, concurrent processes, communication among processes, synchronization among processes, Implementation, data flow model, real-time systems.

UNIT – III
COMMUNICATION PROCESSES:
Need for communication interfaces, RS232/UART, RS422/RS485,USB, Infrared, IEEE1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

UNIT – IV

EMBEDDED/RTOS CONCEPTS-I:

Architecture of the Kernel, Tasks and task scheduler, interrupt service routines, Semaphores, Mutex.

EMBEDDED/RTOS CONCEPTS-II

Mailboxes, Message Queues, Event Registers, Pipes-Signals.

UNIT – V

EMBEDDED/RTOS CONCEPTS –III:

Timers-Memory Management-Priority inversion problem embedded operating systems-Embedded Linux-Real-time operating systems-RT Linux-Handheld operating systems-Windows CE.

TEXT BOOKS:

1. Embedded System Design-A Unified Hardware/Software Introduction- Frank Vahid, Tony D. Givargis, John Wiley & Sons, Inc.2002.
2. Embedded/Real Time Systems- KVKK prasad, Dreamtech press-2005.
3. Introduction to Embedded Systems - Raj Kamal, TMS-2002.

REFERENCE BOOKS:

1. Embedded Microcomputer Systems-Jonathan W.Valvano, Books/Cole, Thomson Learning.
2. An Embedded Software Primer- David E.Simon, pearson Ed.2000

SOFTCOMPUTING TECHNIQUES
(ELECTIVE – IV)

Subject Code: 13EC4045 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- Explain the concepts of neural networks, fuzzy logic, and genetic algorithms.
- Solve problems that are appropriately solved by neural networks, fuzzy logic, and Genetic algorithms.

Course Outcomes:
At the end of the course student will be able to:
CO1: Explain the learning and adaptation capability of neural and fuzzy systems and genetic algorithm.
CO2: Describe the learning and retrieval procedures of various neural networks.
CO3: Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.

UNIT-I
Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, neural network architecture: single layer and multilayer feed forward networks, recurrent Networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

UNIT-II
Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back Propagation algorithm, factors affecting back propagation training, applications.

UNIT-III
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT-IV
Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

UNIT-V:
Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (Encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

Text Books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.
2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.

Reference Books:

1. Siman Haykin,"Neural Networks" Prentice Hall of India
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
3. Kumar Satish, "Neural Networks" Tata Mc Graw Hill

NETWORK SECURITY & CRYPTOGRAPHY
(ELECTIVE – IV)

Subject Code: 13EC4046 **External Marks: 70**
Credits: 3 **Internal Marks: 30**

Course Objectives:

- To clearly recognize the different Security Attacks, Security Services and Security Mechanisms.
- To demonstrate the basic categories of Cryptographic Systems.
- To compute different Conventional Encryption Algorithms.
- To describe the important public-key cryptosystems.
- To analyze the authentication by studying different authentication applications.
- To describe the security approaches related to Electronic Mail
- To express the overall structure of IPSec
- To develop the different firewall principles.

Course Outcomes:
At the end of the course the student will be able to:
CO1**:** Recall different Security Attacks, Services and Mechanisms.
CO2: Classify and explain categories of different encryption and decryption techniques.
CO3: Identify the authentication applications such as Kerberos and x.509 directory services.
CO4: Analyze the usage of PGP and S/MIME.
CO5: Familiar with the importance of IP Security and Web Security.
CO6: Exposed to viruses and related threats and design principles of firewalls.

UNIT-I
Introduction: Security Attacks, Security Services and Security Mechanisms, A Model for Network security.
Non-Cryptographic Protocol Vulnerabilities: Dos, Session Hijacking and Spoofing. **Software Vulnerabilities:** Buffer Overflow, Format String Attacks and SQL Injection. **Basics of Cryptography:** Substitution Techniques, Transposition Techniques, Block and Stream Ciphers.

UNIT-II
Conventional Encryption and Message Confidentiality: Conventional Encryption Principles, Algorithms: DES, Triple DES, Blowfish, IDEA and AES, Cipher Block Modes of Operations, Location of Encryption Devices, Key Distribution.
Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public Key Cryptography Principles, Algorithms: RSA, Diffie-Hellman Key Exchange, Introduction to Elliptic Curve Cryptography, Digital Signatures.

UNIT-III

Authentication Applications - Kerberos: Motivation, Requirements, Version 4, Differences between V4 and V5. **X.509 Authentication Service:** Certificate Formats, Obtaining User Certificate, Revocation of Certificates, Authentication Procedures.

Electronic Mail Security - Pretty Good Privacy: Notation, Operational Description. **S/MIME:** RFC 822, Limitations of SMTP, MIME Overview, MIME Content Types, MIME Transfer Encodings, S/MIME Functionality.

UNIT-IV

IP Security: Overview, Architecture, AH, ESP, Combining Security Associations, Key Management.

Web Security: Considerations, **SSL:** Architecture, Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, **TLS**, **SET:** Overview, Dual Signatures, Payment Processing.

UNIT-V

Intruders: Intrusion Techniques, Password Protection, Intrusion Detection. **Viruses and Related Threats:** Malicious Programs, The Nature of Viruses, Types of Viruses.

Firewalls: Design Principles, Characteristics, Types of Firewalls, Firewall Configurations.

Trusted Systems.

TEXT BOOKS:

1. Network Security Essentials: Applications and Standards, William Stallings, Pearson Education.
2. Cryptography and Network, 2nd Edition, Behrouz A. Fourouzan and Debdeep Mukhopadhyay, McGraw-Hill, 2010.

REFERENCE BOOKS:

1. Cryptography and Network Security: Principles and Practice, William Stallings, Pearson Education.
2. Principles of Information Security, Whitman, Thomson.
3. Introduction to Cryptography, Buchmann, Springer.

INTERNSHIP

Subject Code: 13EC4203 **External Marks: 50**
Credits: 1 **Internal Marks: 25**

PROJECT WORK

Subject Code: 13EC4204 **External Marks: 140**
Credits: 6 **Internal Marks: 60**