AR- 16

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

For

B.TECH. FOUR YEAR DEGREE PROGRAMME
(Applicable for the batches admitted from 2016-2017)

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

M2. Enhance overall personality development which includes innovative and group work exercises, entrepreneur skills, communication skills and employability.

M3. Ensuring effective teaching-learning process to provide in-depth knowledge of principles and its applications pertaining to Electronics & Communication Engineering and interdisciplinary areas.

M4. Providing industry and department interactions through consultancy and sponsored research.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS) OF B.TECH. IN ECE

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

Engineering Graduates will be able to:

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

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

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

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

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

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

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

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

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

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

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

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

PSO-Program Specific Outcomes

PSO1. The Competency in the application of circuit analysis and design.

PSO2. The ability to solve Electronics and Communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.

PSO3. The ability to pursue higher studies in either India or abroad and also lead a successful career with professional ethics.

ACADEMIC REGULATIONS- 2016

(Effective for the students admitted into I year from the Academic Year 2016-2017 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

(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. Course.

Sl. 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**	**2/2.5/3/3.5/4.5**
2	**Open Electives**	**02**
3	**Laboratory Course**	**1.5**
4	**Advanced Laboratory Course**	**02**
5	**Self Study Course/Internship**	**01**
6	**Employability skills**	**1.5**
7	**Project**	**06**

5. Open Electives:

There is one open elective in each semester from 2-1 Semester to 4-1 semester. The student can choose one open elective of respective semester. The pattern of Midterm examinations and end examinations of these courses is similar to regular theory courses and the valuation is purely internal.

6. MOOCs:

Explore all possibilities to run at least one subject in every semester from 2-1 semester onwards as a MOOCcs.

7. 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.

7.1 Theory course:

For theory courses the distribution shall be **30** marks for internal midterm evaluation and **70** marks for the External End - Examinations.

Out of 30 internal midterm marks – **25** marks are allotted for descriptive exam and 5 marks for continuous assessment tests.

Process of conducting assessment test: The assessment test will be conducted for 5 marks. Teacher should give 5 questions after completion of **one and half** units to the students, from which the student has to answer any one of the questions suggested by the teacher in the classroom itself. Similarly there will be another two assessment tests after completion of **Three** units and **Four and half** units from prescribed syllabus. The average marks of these **Three** tests will be considered for 5 marks for the continuous assessment tests finally.

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

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **25** marks with the duration of **120** minutes.

For final calculation of internal marks, weightage of 80% will be given to the student who performed well either in first Mid or second Mid and 20% weightage will be given to other Mid-term examinations.

Mid paper contains descriptive type questions for forty marks and contain four questions. The student should answer 3 out of 4 questions. Each question carries 10 marks (3x10=30M).

The first Midterm examination to be conducted usually after 8 weeks of instruction or after completion of 50 percent syllabus, the second Midterm examination to be conducted usually at the end of instruction after completion of remaining 50 percent syllabus.

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

The question paper shall have descriptive type questions for70 marks. There shall be one question from each unit with internal choice. Each question carries 14 marks. Each course shall consist of five units of syllabus. The student should answer total 5 questions. (5x14M=70M)

7.2. 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** marks 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.

For award of marks for internal tests, weightage of 80% will be given to the student who performed well either in first test or second test and 20% weightage will be given to other test.

7.3 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.

7.4 Self Study Course:

Two 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.

7.5 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) Intellectual Property Rights & Patents

7.6 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.

Three Periods per week are allotted for this course and evaluated in 4-1 semester.

7.7 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.

8. 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.

9. Minimum Academic Requirements:

9.1 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 i.e 40 out of 100, 30 out of 75 (Internal & Semester end examination marks put together), subject to a minimum of 35% marks i.e 24 marks out of 70 and 17 out of 50 in semester end examination.

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

9.2 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
95-100%	10	O
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^+
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 40%	0	F (Fail)

9.3. 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:

$$SGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR}$$ (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.

9.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme.

The CGPA is calculated as below:

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

Where CR = Credits of a course

GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	DIVISION
≥ 7.5	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and <6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	Fail

9.5 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.6 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.

10. 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.

11. Minimum Instruction Days:
The minimum instruction days for each semester shall be **95** clear instruction days.

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

13. **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 2016 (AR16)

(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year from the Academic Year 2017- 2018 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 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
95-100%	10	O
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^+
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 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
≥ 7.5	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and < 6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	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

I B.TECH I – SEMESTER

S. No	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
1	16HS1001	English	3	-	-	3.0	30	70
2	16BS1001	Engineering Mathematics – I	3	1	-	3.5	30	70
3	16HS1003	Environmental Studies	3	-	-	3.0	30	70
4	16BS1003	Engineering Physics	3	1	-	3.5	30	70
5	16EE1002	Network Analysis	3	1	-	3.5	30	70
6	16ME1002	Engineering Mechanics	3	1	-	3.5	30	70
7	16BS1101	Engineering Physics Lab	-		3	1.5	25	50
8	16HS1101	Basic English Communication Skills Lab	-		3	1.5	25	50
9	16CS1103	Information Technology Work Shop Lab	-		3	1.5	25	50
TOTAL PERIODS/TOTAL CREDITS			**31**			**24.5**	**825**	

I B.TECH II– SEMESTER

S. No	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
01	16HS1002	English Communication Practice	3	-	-	3.0	30	70
02	16BS1002	Engineering Mathematics - II	3	1	-	3.5	30	70
03	16BS1004	Engineering Chemistry	3	1	-	3.5	30	70
04	16ME1001	Engineering Drawing	3	-	-	3.0	30	70
05	16EC1001	Electronic Devices	3	1	-	3.5	30	70
06	16CS1001	Computer Programming	3	1	-	3.5	30	70
07	16BS1102	Engineering Chemistry Lab	-		3	1.5	25	50
08	16EC1101	Electronic Devices Lab	-		3	1.5	25	50
09	16CS1101	Computer Programming Lab	-		3	1.5	25	50
TOTAL PERIODS/TOTAL CREDITS			**31**			**24.5**	**825**	

II B.TECH I – SEMESTER

S. No.	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
01	16EC2003	Signals & Systems	3	1	-	3.5	30	70
02	16EC2004	Pulse & Digital Circuits	3	1	-	3.5	30	70
03	16EC2006	Electronic Circuits-I	3	1	-	3.5	30	70
04	16EE2005	Linear Control Systems	3	-	-	3.0	30	70
05	16EE2006	Electrical Technology	2	-	-	2.0	30	70
06	XXXXXX	***Open Elective - I***	2	-	-	2.0	30	70
07	16EC2103	Electronic Circuits – I Lab	-	-	3	1.5	25	50
08	16EC2104	Pulse & Digital Circuits Lab	-	-	3	1.5	25	50
09	16EE2103	Networks and Electrical Technology Lab	-	-	3	1.5	25	50
10	16HS2201	Professional Ethics and Morals	2	-	-	-	0	0
TOTAL PERIODS/TOTAL CREDITS			**30**			**22**	**825**	

Open Elective – I

S.No.	CODE	COURSE	Offered by Dept
1	16OE2011	Matrices and Applications	BS&H
2	16OE2013	Introduction to MATLAB	EEE
3	16OE2014	Fundamentals of Material Science	MECH
4	16OE2016	UNIX Utilities	CSE
5	16OE2017	IT systems Management	IT
6	16OE2018	Fundamentals of Strength of materials	CIVIL

II B.TECH **II– SEMESTER**

S. No.	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
01	16EC2007	Analog Communications	3	1	-	3.5	30	70
02	16EC2008	Electro Magnetic Field Theory & Transmission Lines	3	1	-	3.5	30	70
03	16EC2009	Electronic Circuits-II	3	1	-	3.5	30	70
04	16EC2010	Digital Electronics	3	-	-	3.0	30	70
05	16EC2012	Random variables & Stochastic Processes	2	-	-	2.0	30	70
06	XXXXXX	***Open Elective - II***	2	-	-	2.0	30	70
07	16EC2105	Analog communications Lab	-	-	3	1.5	25	50
08	16EC2107	Digital Electronics Lab	-	-	3	1.5	25	50
09	16EC2108	Electronic Circuits – II Lab	-	-	3	1.5	25	50
10	16EC2201	Self Study Course - I*	-	2	-	1.0	30	70
TOTAL PERIODS/TOTAL CREDITS			**30**			**23**	**925**	

*2 Periods which includes library, e-learning, internet and presentation.

Open Elective – II

S.No.	CODE	COURSE	Offered by Dept
1	16OE2023	Renewable Energy Sources	EEE
2	16OE2024	Principles of Mechanical Measurements	MECH
3	16OE2026	Introduction to Java	CSE
4	16OE2027	Introduction to PYTHON	IT
5	16OE2028	Complex Variables	BS&H
6	16OE202A	Remote sensing	CIVIL

III B.TECH **I – SEMESTER**

S. No.	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
01	16EC3013	Digital Communications	3	1	-	3.5	30	70
02	16EC3014	Linear IC Applications	3	1	-	3.5	30	70
03	16EC3017	Digital IC Applications	3	1	-	3.5	30	70
04	16HS3005	Managerial Economics & Management Science	3	-	-	3.0	30	70
05	16EC3018	Electronic Measurements and Instrumentation	2	-	-	2.0	30	70
06	XXXXXX	***Open Elective – III***	2	-	-	2.0	30	70
07	16EC3109	Digital Communications Lab	-	-	3	1.5	25	50
08	16EC3110	ECAD Lab	-	-	3	1.5	25	50
09	16EC3111	Linear IC Applications Lab	-	-	3	1.5	25	50
10	16EC3202	Self Study Course - II*	-	2	-	1.0	25	50
TOTAL PERIODS/TOTAL CREDITS			**30**			**23**	**900**	

*2 Periods which includes library, e-learning, internet and presentation.

Open Elective – III

S. No	CODE	COURSE	Offered by Dept
1	16OE3031	Fundamentals of Fuzzy logic	BS&H
2	16OE3032	Environmental Impact Assessment	CIVIL
3	16OE3033	Energy Audit Conservation and Management	EEE
4	16OE3034	Elements of Workshop Technology	MECH
5	16OE3036	Social Networks	CSE
6	16OE3037	Fundamentals of Computer Graphics	IT

III B.TECH **II – SEMESTER**

S. No	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
01	16EC3019	Antenna and Wave Propagation	3	1	-	3.5	30	70
02	16EC3020	Microprocessors and Microcontrollers	3	1	-	3.5	30	70
03	16EC3021	Digital Signal Processing	3	-	-	3.0	30	70
04	16EC3022	Computer Organization & Architecture	3	-	-	3.0	30	70
05	XXXXXX	***Elective - I***	3	-	-	3.0	30	70
06	XXXXXX	***Open Elective – IV***	2	-	-	2.0	30	70
07	16HS3102	Advanced English Communication Skills Lab	-	-	3	1.5	25	50
08	16EC3112	Digital Signal Processing Lab	-	-	4	2	25	50
09	16EC3113	Microprocessors & Microcontrollers Lab	-	-	3	1.5	25	50
10	16HS3202	Intellectual Property Rights and Patents	2	-	-	-	-	-
TOTAL PERIODS/TOTAL CREDITS			**31**			**23**	**825**	

Elective – I

S.No.	CODE	COURSE
1	16EC3023	Optical Communication & Networks
2	16EC3024	Telecommunication Switching Systems
3	16EC3025	Bio-Medical Instrumentation
4	16EC3026	Transform Techniques

Open Elective – IV

S.No.	CODE	COURSE	Offered by Dept
1	16OE3041	Management Information Systems (MIS)	MBA
2	16OE3042	Natural Disaster Management	CIVIL
3	16OE3043	Special Machines	EEE
4	16OE3044	Introduction to Automobile Engineering	MECH
5	16OE3046	Simulation and Modeling	CSE
6	16OE3047	Soft Computing	IT

IV B.TECH **I – SEMESTER**

S. No.	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
1	16EC4027	Microwave Engineering	3	1	-	3.5	30	70
2	16EC4028	Digital Image Processing	3	1	-	3.5	30	70
3	16EC4029	VLSI Design	3	1	-	3.5	30	70
4	16EC4030	Global Positioning System	2	-	-	2.0	30	70
5	XXXXXX	***Elective - II***	3	-	-	3.0	30	70
6	XXXXXX	***Open Elective – V***	2	-	-	2.0	30	70
7	16EC4114	Microwave Engineering Lab	-	-	3	1.5	25	50
8	16EC4115	Image Processing Lab	-	-	3	1.5	25	50
9	16EC4116	VLSI Lab	-	-	4	2.0	25	50
10	16HS4203	Employability Skills	-	3	-	1.5	75	-
TOTAL PERIODS/TOTAL CREDITS			**32**			**24**	**900**	

Elective – II

S. No	CODE	COURSE
1	16EC4031	Satellite Communications
2	16EC4032	Computer Networks
3	16EC4033	EMI & EMC
4	16EC4034	Advanced Computer Architecture

Open Elective – V

S. No	CODE	COURSE	Offered by Dept
1	16OE4051	Project Management	MBA
2	16OE4053	Power Quality Management	EEE
3	16OE4054	Fundamentals of Robotics	MECH
4	16OE4056	Introduction to Cloud Computing	CSE
5	16OE4057	Introduction to DBMS	IT
6	16OE4058	Entrepreneurial Development	MBA
7	16OE4059	Geographical Information Systems	CIVIL

IV B.TECH **II – SEMESTER**

S. No.	Sub. Code	SUBJECT	L	T	P	C	INT	EXT
01	16EC4035	Wireless Communications	3	-	-	3.0	30	70
02	16EC4036	Radar Engineering		-	-	3.0	30	70
03	XXXXXX	Elective - III	3	-	-	3.0	30	70
04	16EC4203	Internship	-	-	-	1.0	25	50
05	16EC4204	Project Work	-	-	-	6.0	60	140
TOTAL PERIODS/TOTAL CREDITS			**9**			**16**	**575**	

Elective – III

S. No.	CODE	COURSE
1	16EC4037	Nano Technology
2	16EC4038	Microcontroller and Applications
3	16EC4039	Optimization Techniques
4	16EC4040	Artificial Neural Networks

L - LECTURE HOURS/WEEK

T- TUTORIAL HOURS/WEEK

P- PRACTICAL HOURS/WEEK

C- CREDITS

INT-INTERNAL MARKS

EXT- EXTERNAL MARKS

ENGLISH

Subject Code: 16HS1001 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives

- To improve comprehension levels of the students while reading texts in English
- To enable students interpret data and present their perspective on it
- To help students learn the techniques of expanding their vocabulary
- To assist students use grammar effectively in both speech and writing
- To enable students to write formal letters and short essays

Course Outcomes

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

CO1: read and comprehend seen and unseen passages and answer questions based on them.
CO2: interpret the content of a passage and state their perspective.
CO3: understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
CO4: use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
CO5: write sentences, paragraphs, formal letters, emails, short essays on any given topic.

Course Syllabus

Unit–I: Read and Proceed: Reading—Vocabulary—Grammar—Writing Sentences
Unit–II: Health: Reading—Vocabulary—Grammar—Types of Writing
Unit–III: Travel: Reading—Vocabulary—Grammar—Paragraph Writing
Unit–IV: Disaster Management: Reading—Vocabulary—Grammar—Writing Letters & Emails
Unit–V: Gender: Reading—Vocabulary—Grammar—Writing an Essay

Course Material:

Textbook

Rani, K. Nirupa et al. *Step by Step*. Pearson: New Delhi, 2013.

Reference Books

1. Maison, Margaret M. Examine Your English. Orient Longman: Hyderabad, 2003.
2. Taylor, Grant. English Conversation Practice. Tata McGraw-Hill: New Delhi, 2008.
3. Wood, Frederick T. A Remedial English Grammar for Foreign Students. Macmillan, 1966.

ENGINEERING MATHEMATICS – I

Subject Code: 16BS1001 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES

- To identify & solve the 1st order differential equations and apply in Engineering.
- To understand the process of solving a 2nd and higher order differential equation and solve it. Identify a 2nd and higher order differential equation & solve it in engineering topics.
- To understand the generalized mean value theorems & their use to find the series expansions of functions and in turn their application in finding the maxima and minima of two variable functions.
- To solve the multiple integrals and to develop the capacity of a student to understand the applications of multiple integrals.
- To understand the mathematical and physical interpretation of Vector differential operator operating on a vector or scalar point function, the line, surface and volume integrals, vector integral theorems and their applications to find work done, area, and volume.

COURSE OUTCOMES

On completion of this course, students should be able

CO1: Solve the 1st order differential equations by identifying the suitable method.
CO2: Identify and solve a 2nd and higher order differential equations and perform simple applications in Engineering.
CO3: Estimate the maxima and minima of two variable functions under different constraints.
CO4: Solve a multiple integral and apply to estimate the volume and surface area of the solids.
CO5: Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.

Unit – I Linear Differential Equations of first order
Linear differential equations of first order and first degree – exact, linear and Bernoulli. 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, Cauchy's and Euler's equations.

Unit-III Partial Differentiation

Introduction-Total derivative - Chain rule - Generalized Mean Value theorem for One variable & two variable functions (without proof)-Taylors and Mc Laurent's series for two variables – Functional dependence – Jacobian. Maxima and Minima of functions of two variables with constraints and without constraints.

Unit-IV Multiple Integrals

Multiple integrals - double and triple integrals – change of variables in Double & Triple Integrals – Change of order of integration-Cartesian and Polar coordinates.

Unit-V Vector Calculus

Vector Differentiation: Gradient- Divergence- Curl - Laplacian and second order operators-Vector identities (without proof).

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- Work done, Force.

Text Books:

1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics, Volume-I, II 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..

ENVIRONMENTAL STUDIES

Subject Code: 16HS1003 **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.

Course Outcomes:
On completion of this course, students will be able to

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 eco-friendly 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
Multidisciplinary nature of Environmental Studies:
Definition of Environment – Scope, Importance and multidisciplinary nature of the course - Need for Public Awareness
Natural Resources:
Forest Resources - Use and over exploitation - deforestation – consequences – solutions - case studies
Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment
Mineral Resources - Use and exploitation - Tribal and environmental effects of extracting and using mineral resources - case studies

Food Resources – Food security concept - 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 - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources - case studies
Land resources – Reasons for land degradation - Human induced landslides - soil erosion and desertification

UNIT – II
Ecosystems:
Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow - Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession, Types - characteristic features of the following ecosystems: Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (lakes and oceans)
Biodiversity and its conservation:
Definition of Biodiversity – genetic, species and ecosystem diversities - Values of biodiversity - Bio-geographical classification of India - India as a mega-diversity nation – Hotspots of biodiversity (India) - Endangered and endemic species of India – Threats to biodiversity - Conservation of biodiversity

UNIT – III
Environmental Pollution:
Definition – causes - effects - control measures of Air pollution - Water pollution - Marine pollution - Noise pollution - Nuclear hazards
Solid waste Management: Causes - effects - disposal methods of urban waste - biomedical wastes - case studies
Disaster management: floods – earthquakes - cyclones

UNIT – IV
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 - case studies. Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion - World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – EIA - definition – significance - scope – stages of EIA – Concept of Bioremediation – Concept of Carbon Sequestration – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act - Forest (Conservation) Act

UNIT – V
Human Population and the Environment:
Population growth patterns - variation among nations - Population problems - control - Environment and human health - Role of information Technology in Environment and human health
Field work:
Visit to local area to document environmental assets - River/ forest/ grassland/ hill/ mountain
Visit to local polluted sites Urban/ Rural/ industrial/ Agricultural

Study of common plants/ insects/ birds - Study of simple ecosystems ponds/ rivers/ hill slopes

Text Books:

1. Shashi Chawla. 2015, *A Text book of Environmental Studies*, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, *Environmental Studies*, Revised edition, TMH, New Delhi

Reference:

1. Odum, E.P. 1971, *Fundamentals of Ecology*, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.
2. P. D. Sharma. 1996, *Ecology and Environment*, Revised edition, Rastogi Publications (P) Ltd
3. Cunningham, W.P., Cunningham, M.A., *Principles of Environmental Science*, TMH, New Delhi
4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, Mc Graw – Hill International edition
5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, Pearson Publications

ENGINEEIRNG PHYSICS

Subject Code: 16BS1003 **Internal Marks: 30**
Credits: 3.5 **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 define the shortcoming of classical physics and describe the need for modifications to classical theory
- To possess an insight on Magnetic Properties pertaining to Material Fabrication
- To estimate the response of E-Field on Dielectric Materials to control the device performance

COURSE OUTCOME

At the end of the course students will be able to

CO1: Apply the principles of optics in designing optical devices
CO2: outline the Principles of Lasers and Fiber Optics
CO3: resolve the discrepancies in classical estimates through quantum principles
CO4: Interpret the knowledge of Magnetic Properties in Material Fabrication
CO5: explain the response of E-Field on Dielectric Materials to control the device Performance

UNIT- I: WAVE OPTICS

Interference - Introduction, Principle of Superposition of Waves, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light, Applications of Interference-Testing of Flatness of Surfaces, Anti Reflecting Coatings

Diffraction - Introduction, Differences between Interference and Diffraction, Fraunhofer Diffraction due to Single Slit – Intensity Distribution

UNIT-I: LASERS & FIBER OPTICS

Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients (Qualitative), Population Inversion, Optical Resonator and Lasing Action, Ruby Laser [Three Level System], Helium-Neon Laser [Four Level System], Applications of Lasers in Industry, Scientific and Medical Fields.

Fiber Optics - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Appications of Optical Fibers in Communication

UNIT-III: PRELIMINARY QUANTUM MECHANICS

Introduction, Waves and Particles, Wave Particle Duality and De-Broglie Hypothesis, Heisenberg's Uncertainty Principle – Applications (a) Non Existence of Electrons in Nucleus (b) Existence of Protons and Neutrons in Nucleus (c) Radiation of Light from an excited atom, Time independent Schrödinger wave equation, Physical Significance of Wave Function, Particle in One Dimensional Potential Box, Comparison of Maxwell Boltzmann, Bose Einstein and Fermi Dirac Statistics (Qualitative Treatment only)

UNIT-IV: MAGNETIC PROPERTIES

Introduction, Basic Terms, Relation between B, H & I, Origin of Magnetic Moment – Bohr Magnetron, Classification of Magnetic Materials – Dia, Para and Ferro, Domain Theory of Ferromagnetism – Hysteresis, , Soft and Hard Magnetic Materials, Applications- Ferrites and Eddy Current Losses Transformer Cores, Concept of Magnetostriction.

UNIT-V: DIELECTRIC MATERIALS

Introduction, Basic Terms – Relation between D, E & P, Electronic Polarizability, Ionic Polarizability, Orienational Polarizability (both Qualitative and Quantitative), Total Polarizability, Frequency Dependence of Polarizability, Dielectric Loss and Dielectric Breakdown, Applications of Dielectrics – Solid Insulating Materials, Liquid Insulating Materials, Dielectric Heating, Concept of Ferro Electricity - Spontaneous Polarization in Barium Titanate Crystal, Concept of Piezoelectricity.

Texts Book

1. A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers

References

1. University Physics by Young and Freedman
2. Fundamentals of Physics by Resnick, Halliday and Walker
3. Concepts of Modern Physics by Arthur Beiser, McGraw-Hill Pubishers
4. Solid State Physics by S. O. Pillai, New Age International Pubishers
5. Engineering Physics, Volume-I&II, P.K.Palani Swamy, Scitech Publications Hyderabad
6. Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
7. Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

NETWORK ANALYSIS

Subject Code: 16EE1002 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives

- This course introduces the basic concepts of network parameters.
- The emphasis of this course is laid on the basic analysis of circuits which includes single phase AC circuits, theorems, transient analysis.

Course Outcomes

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

CO1: Apply the basic circuit analysis techniques, power terminology in AC circuits and application of these concepts in analyzing complex DC and AC circuits.
CO2: Discuss and apply the basic electrical laws.
CO3: Analyze steady state analysis of AC circuits
CO4: Compute the AC and DC circuits with theorems
CO5: Illustrate DC transients and two port networks

UNIT – I

Introduction to Electrical Circuits: Network elements classification, Electric charge and current, Electric energy and potential, Resistance, Inductance, Capacitance – series and parallel combination, Energy sources (Ideal, Non-ideal, Independent and dependent sources), Source transformation, Voltage division, current division (explanation with relevant theory and problems)

UNIT – II

Kirchhoff's laws: Definitions of KCL, KVL. Mesh analysis and Nodal analysis, Star-Delta conversion (with resistances only).

AC Fundamentals: Definitions of terms associated with periodic functions: Time period, angular velocity and frequency, RMS value, average value, Form factor and peak factor of different waveforms.

UNIT – III

Steady State Analysis of AC Circuits: Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, series R-L, R-C, R-L-C circuits (explanation with relevant theory and problems).

Resonance: Introduction, definition of Q, series resonance, bandwidth of series resonance, Parallel resonance (explanation with relevant theory and problems).

UNIT – IV

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

UNIT – V

Two-port networks: Z-parameters, Y-parameters, Transmission line parameters, h-parameters, relationship between parameter sets (explanation with relevant theory and problems using independent sources only)

DC Transients: Definition of time constants, Response of R-L, R-C, RLC circuit with DC excitation.(explanation with relevant theory and problems)

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 - Sudhakar/shyammohan, TMH.

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. Umesh Sinha, Satya Prakashan Pub., 1983, 3/e.

ENGINEERING MECHANICS

Subject Code: 16ME1002 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives

- To provide knowledge on system of forces, free body diagram.
- To provide knowledge on friction between two mating surfaces.
- To provide knowledge on centre of gravity and moment of inertia for different sections.

Course Outcomes

At the end of the course the student will be able to:
CO1: Know the system of forces and calculate the resultant of different force system.
CO2: Draw the free body diagram and understand the concept of moment and couple.
CO3: Know the friction between two mating surfaces and calculate cetroid of plane areas.
CO4: Determine area and mass moment of inertia for different sections.
CO5: Determine the kinematic relations of particles & rigid bodies.

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 CENTRE OF GRAVITY: Centre of gravity – centroids of area and lines – determination of centroids 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 Books :

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.

ENGINEEIRNG PHYSICS LAB

Subject Code: 16BS1101 **Internal Marks: 25**
Credits: 1.5 **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 with precision measurements to estimate error for targeted accuracy
- 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 OUTCOME

At the end of the course students 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 with precision measurements to estimate error for targeted accuracy

CO4: Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics

CO5: Evaluate characteristics of magnetic, dielectric and semiconducting material devices

LIST OF EXPERIMENTS (Any Ten Experiments have to be completed)

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing
3. Determination of Rigidity Modulus of the Material of Wire using Torsional Pendulum
4. Verification of Laws of Transverse vibrations in Stretched Strings using Sonometer
5. Wedge method – Determination of Thickness of Thin Object
6. Determination of Numerical Aperture and Bending Loss of an Optical Fiber

7. Determination of Acceleration due to Gravity (g) using Compound Pendulum
8. Determination of Energy Band Gap using the given Semiconductor Diode
9. Newton's Rings – Determination of the Radius of Curvature of given Plano Convex Lens
10. Slit Width Determination with Single Slit Diffraction Pattern using LASER
11. Study of Characteristics of Thermistor
12. Determination of Wavelength of Monochromatic Source using LASER Diffraction
13. Determination of the Frequency of the given Tuning Fork using Volume Resonator
14. Study of the variation of Magnetic Field along the axis of a Circular Coil using Stewart and Gee's Method.
15. Diffraction Grating: Normal Incidence – Determination of Wavelength of Monochromatic Source

Manual / Record Book

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)

BASIC ENGLISH COMMUNICATION SKILLS LABORATORY

Subject Code: 16HS1101 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives

- To get students pronounce words correctly and speak with proper intonation
- To help students understand people speaking with different accents
- To enable students to describe objects and events effectively
- To help students approach a book with effective reading techniques
- To help students comprehend and interpret data provided in graphs, tables etc.

Course Outcome

CO1: Students will be able to pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.
CO2: Students will be able to comprehend audio and video clips of different accents.
CO3: Students will be able to describe / discuss / explain a given situation / context well.
CO4: Students will be able to read and recall what they have read.
CO5: Students will be able to understand and interpret information provided in graphs, tables etc.

Course Syllabus

Unit I: Received Pronunciation—Speech sounds of English—Intonation
Unit II: Comprehension of Audio and Video Clips of different Accents
Unit III: Greetings—Self-introduction—Introducing others—Story telling—Narrating an incident / event / person / picture
Unit–IV: Reading: SQ3R Technique (Survey-Question-Read-Recite/Recall-Review)
Unit V: Interpreting data of graphs, tables etc. orally and in writing

Course Material:

Textbook

Rani, K. Nirupa et al. *Speak Well*. Orient Blackswan: Hyderabad, 2012.

Reference Books

1. Prasad, M. Hari et al. *Strengthen Your Steps*. Maruthi: Hyderabad, 2010.
2. Prasad, M. Hari et al. *Strengthen Your Communication Skills*. Maruthi: Hyd, 2014.
3. Ashraf, M. Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2005.

INFORMATION TECHNOLOGY WORKSHOP LAB

Subject Code: 16CS1103 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives

- PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows Linux and the required device drivers.
- All the DOS commands would be covered for maintains of the operating system.
- Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered.
- Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools.

Course Outcomes

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

CO1: Gain knowledge on computer system such as system unit, input devices, output devices connected to the computer.

CO2: Understand the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.

CO3: Gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.

CO4: Get familiarize with parts of Word window, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.

CO5:Get familiarize with parts of Excel window, To create and save a workbook with single and/or multiple worksheets, To apply operations on range of cells using built-in formulae, etc.

CO6: Get familiarize with parts of PowerPoint win, to create and save a new presentation, apply design templates to a presentation, to insert, edit and delete a slide , etc.

PC Hardware

Task 1: Identification of the peripherals of a computer.

To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions.

Task 2:(Optional) : A practice on disassemble the components of a PC and assembling them to working condition.

Task 3: Installation of WINDOW XP Operating system in PC.

Task 4: Introduction to all internal and external DOS commands

Task 5: Installation of LINUX operating system in PC
Internet & World Wide Web

Task 6: Surfing the Web using Web Browsers and Search engine: How to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers. And 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.

MS – Word
Word Orientation: Describe Importance of MS- Word

Task 7: 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 Word.

Task 8: Creating project abstract for using MS-WORD: Abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Task 9: 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

Task 10: Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

MS-Excel
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 11: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text
Task 12: Creating Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
Task 13: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,
Task 14: Creating Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

MS-Power Point

Task 15 : 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, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint

Task 16 : Concentrating on the in and out of Microsoft power point, Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

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)

Reference Books:

1. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008
2. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech

ENGLISH COMMUNICATION PRACTICE

Subject Code: 16HS1002 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives

- To assist students use grammar effectively in both speech and writing
- To improve communication skills of students by making them participate in different language activities
- To help students acquire the study skills of 'Note taking' and 'Note making'
- To assist students to use reading techniques learnt in English for other subjects
- To enable students to summarize, paraphrase and review a piece of writing

Course Outcome

At the end of the course:

CO1: Students will be able to use grammar appropriately in speech and writing.
CO2: Students will be able to describe, discuss, explain and interpret a given situation/ context effectively.
CO3: Students will be able to read texts and listen to lectures and make notes on them.
CO4: Students will be able to apply reading techniques in their other subjects.
CO5: Students will be able to summarize, paraphrase and review a piece of writing efficiently.

Course Syllabus

Unit–I: Grammar: Regular & Irregular Verbs—Tenses—Voice—Reported Speech—Auxiliaries and Modals—*If* Conditionals— Degrees of Comparison—Simple, Compound, Complex Sentences— Question Tag—Correction of Sentences
Unit –II: Situational Dialogues in general—Situational Dialogues on Acceptance and Rejection of Invitation—Debate—JAM— Public Speaking
Unit–III: Study Skills: Note taking and Note making
Unit-IV: Intensive and Extensive reading—Skimming and Scanning
Unit–V: Summarising / Paraphrasing / Reviewing an article orally and in writing

Course Material:

Textbook

Rani, K. Nirupa et al. *Speak Well*. Orient Blackswan: Hyderabad, 2012.

Reference Books

1. Wood, Frederick T. A Remedial English Grammar for Foreign Students. Macmillan, 1966.
2. Heaton, John Brian et al. Longman Dictionary of Common Errors. Longman, 1977.
3. Taylor, Grant. English Conversation Practice. Tata McGraw-Hill: New Delhi, 2008.
4. Ashraf, M. Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2005.

ENGINEERING MATHEMATICS – II

Subject Code: 16BS1002 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES

- To solve the algebraic and transcendental equations, using different numerical method. Estimate the best curve for a given data.
- To estimate the value of derivatives, evaluate the definite integrals using different numerical methods and calculate the numerical solution of an ordinary differential equation i.e IVP .
- To explain Laplace transform of continuous functions using Laplace transform formulae & properties, apply Laplace transform to solve an I.V.P &B.V.P
- Perform the Fourier series and half range series expansion of different functions in different intervals.
- Interpret the methods of solving a linear and non-linear 1^{st} order partial differential equation and 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: Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, 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.
CO2: Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
CO3: Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
CO4: Deduce the Fourier series and half range series expansions of different functions for different intervals.
CO5: Solve a linear and non-linear 1^{st} order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation

Unit – I Numerical solutions of Equations and Interpolation
Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.
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.

Unit-II
Numerical Differentiation, Integration and solution of Ordinary Differential equations
Numerical Differentiation and Integration: Numerical Differentiation using finite differences – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

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-III 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. Solution of ordinary differential equations using Laplace transforms.

Unit-IV 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.

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- 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 CHEMISTRY

Subject Code: 16BS1004 **Internal Marks: 30**
Credits: 3.5 **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 construction of Photovoltaic cells.

Course Outcomes

At the end of the course the student will be able to:
CO1: Differentiate different molding techniques of plastic material.
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 Photovoltaic cell.

UNIT-I: POLYMER SCIENCE & INORGANIC ENGINEERING MATERIALS

Definitions of Polymer, Polymerization – Functionality – Degree of polymerization - Types of polymerization (addition and condensation polymerizations). Plastics – Definition, Thermoplastics, Thermosetting Plastics – Compounding of Plastics – Moulding of plastics into Articles (Compression, injection, transfer and extrusion moulding methods).
Cement: Classification of cements – Manufacture of Portland cement – Raw Materials - Chemical composition of Portland cement - Setting and Hardening of Portland Cement.

UNIT-II: WATER TECHNOLOGY

Hardness of Water – Temporary and Permanent Hardness - Units and Inter Conversions of Units - Estimation of Hardness by EDTA Methods - Treatment of Water for Domestic Purposes - Sedimentation – Coagulation – Filtration - Disinfection – Sterilization – Chlorination - Break Point chlorination – Ozonisation - Industrial Water Treatments: Desalination – Electro Dialysis - Reverse Osmosis - Lime-Soda Process - Zeolite Process - Ion-Exchange Process.

UNIT-III: CORROSION AND ITS CONTROL

Definition, Causes and Effects of Corrosion - Theories of Corrosion (Chemical and Electrochemical Corrosion) - Mechanism of Electrochemical Corrosion (Oxygen Absorption Type and Hydrogen Evolution Type) - Types of Corrosion (Galvanic Corrosion, Differential Aeration Corrosion, Water Line Corrosion, Pitting Corrosion and Stress corrosion) - Galvanic Series - Factors affecting Rate of Corrosion (Nature of Metal and Nature of Environment).

Controlling of Corrosion: Proper Designing - Modifying the Environment - Cathodic Protection (Sacrificial Anodic and Impressed Current).

UNIT-IV: FUEL TECHNOLOGY & LUBRICANTS

Classification of Crude Oil-Fractional Distillation of Petroleum- Manufacturing Of Synthetic Petrol (Fischer-Tropsch & Bergius Process) - Knocking –Anti Knocking Agents-Octane & Cetane Number.

Lubricants: Definition and functions of lubricants – classification of lubricants - mechanism of lubrication – Thick film, Thin film and Extreme pressure lubrication - properties of lubricants - Viscosity, flash and fire points, cloud and pour points, aniline point, neutralization number and mechanical strength.

UNIT-V: ENERGY SOURCES

Chemical sources of energy: Single electrode potential - Faraday Laws – electro chemical series - Nernst Equation – reference electrodes – calomel electrode – NHE (or) SHE -

Renewable energy Source (Solar Energy): Green house concept – harnessing of solar energy – Photovoltaic cells – concentrated power plants – parabolic trough – solar dish - solar tower.

Text Books:

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

Reference Books:

1. "A Text Book of Engineering Chemistry", Sunita Rattan, S.K. Kataria& Sons (2012). 4th edition
2. "A Text Book of Engineering Chemistry", S. Nagarajan, R. Gopalan, D.Venkatappayya, Vikas Publishing House (Latest Edition).
3. "Engineering Chemistry", Wiley India Editorial Team, Wiley Publishers (2011). 5th edition

ENGINEERING DRAWING

Subject Code: 16ME1001 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives

- To develop drawing skills and representation of I angle and III angle projection, isometric Projection, Isometric drawing.

Course Outcomes

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

CO1: Construct Polygons, Ellipse And Scales(Plain, Diagonal,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

Lines, Lettering and Dimensioning: Introduction to Drawing instruments and their uses, Types of lines, Lettering ,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 Conic sections–parabola, ellipse and hyperbola using General Method, construction of ellipse using oblong and concentric circles methods. Construction of cycloid & involute.

UNIT II

Orthographic Projections: First and Third Angle Projections:

Projections of Points. Projections of Straight Lines inclined to one reference plane only.

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 only.

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. Bhatt & V. M Panchal, 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", 11th Edition, Prentice Hall India.

ELECTRONIC DEVICES

Subject Code: 16EC1001 **Internal Marks: 30**
Credits: 3.5 **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

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

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 & FET) in different configurations
CO5: Explain the working and applications of SCR, UJT and MOSFETs

Unit-I

Electron Ballistics and Applications: Motion of Charged Particles in Electric field; Motion of Charged Particles in Magnetic field; Motion of Charged Particles in Parallel Electric and Magnetic fields and Perpendicular Electric and Magnetic Fields; Two Dimensional Motion; Electrostatic Deflection in CRT; Electrostatic Focusing in CRT; Block diagram of CRT; Block diagram of CRO; Measurement of voltage, current, time and phase using CRO.

Unit- II

Review of Semi Conductor Physics : Insulators, Semi conductors and Metals classification using Energy Band Diagrams; Mobility and Conductivity; Electrons and holes in an Intrinsic Semi conductors; Effective mass; Donor and acceptor impurities (Extrinsic Semi Conductors); Mass action law; Charge densities in a semiconductor; Electrical properties of Ge and Si; Hall effect; Generation and Recombination of Charges; Diffusion; Einstein Relationship; Total current; Continuity Equation; Injected Minority Carriers; Fermi Dirac Function; Carrier concentration and Fermi level in conductors ,Intrinsic and Extrinsic Semiconductors

Unit- III

Junction Diode Characteristics : Open circuited P N Junction; Forward and Reverse Bias; Energy Band Diagram of PN Diode; Volt-Ampere Characteristic; Current components in PN Diode; Law of junction; Total diode current; Temperature Dependence of the V/I characteristic; Diode Resistance (Static and Dynamic); Space charge or Transition capacitance; Diffusion capacitance.

Special Diodes: Avalanche and Zener Break Down; VI characteristics and applications of Zener diode, Tunnel Diode, Varactor Diode, LED, and Photo Diode.

Unit IV

Transistors: Junction transistor; Transistor current components; Characteristics of Transistor in Common Base, Common Emitter and Common Collector configuration; Analytical expressions for Transistor Characteristics; Punch Through/Reach Through; Transistor as an amplifier; V-I characteristics and applications of Photo Transistor.

Unit V

Field Effect Transistors: Construction of JFET, Comparison between BJT & JFET, JFET characteristics and parameters, Pinch-Off voltage, Construction of MOSFET, MOSFET characteristics (Enhancement and depletion mode).

Introduction to SCR and UJT and their characteristics.

Text Books

1. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill, 2009.
2. Electronic Devices and Circuits – Salivahanan, Suresh Kumar, TATA McGraw Hill, Second Edition. .

Reference Books

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill.
2. Electronic Devices - Floyd 5th Edition , Pearson Education.
3. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition, 2006.

COMPUTER PROGRAMMING

Subject Code: 16CS1001 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

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 this is the backbone of effective memory handling.
- To study the advantages of user defined data type this 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:

Computer Languages: Machine, Assembly and High-level, algorithm, flowchart, Program Development Steps.

Introduction to C: Character set, **Tokens:** Identifiers, keywords, data types, constants, variables, **Operators:** Arithmetic, relational, logical, assignment, bitwise, conditional and special (increment, decrement, comma)

Basic I/O statements, structure of a program, simple programs

Unit-II:

Control Structures: Decision Making: if, if-else, nested if, switch **Iteration:** while, for, do-while, nested loops **Branching:** Break, continue, goto

Unit-III:

Arrays: Definition, Types: 1D, 2D, declaration, initialization, accessing elements, Matrix operations

Functions: Definition, user defined function declaration, types of user defined functions, parameter passing, recursion, library functions, storage classes, passing arrays to function, string manipulations, preprocessor

Unit-IV:

Pointers: Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memory allocation

Structures: Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions

Unit-V:

File Handling: Types, operations on files, modes, file I/O functions, Random Access Functions.

Text Books:

1. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.
2. Yashwant Kanikar. 2012. Let Us C, 8th Ed.. PBP Publications.

Reference Books:

1. Dr. N.B Venkateswarlu. 2009. C and Data Structures: A snap shot Oriented Treatise Using Live Engineering Examples. S. Chand & Co., New Delhi.
2. B. W Kernighan, Dennis M. Ritchie . The C – Programming Language. PHI.

ENGINEERING CHEMISTRY LABORATORY

Subject Code: 16BS1102 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To understand the determination of Dissolved Oxygen and Turbidity of water samples.
- To become familiar with the determination of viscosity, flash point and acid value of oil.
- To learn concepts of pH and conductometric titrations.
- To understand the determination of hardness of water 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 Dissolved Oxygen. and Turbidity of water samples.
CO2: Explain the importance of viscosity, Flash point and Acid value of a lubricant.
CO3: Determine the amount of acid or base by pH metric and conductometric titrations.
CO4: Determine the hardness of various water samples.
CO5: Operate all the instruments in the chemistry laboratory analysis.

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

1. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
2. Nephelometric determination of Turbidity present in the given water sample.
3. Determination of Kinematic Viscosity of a given oil sample by using Viscometer.
4. Determination of Flash and Fire points of given Oil Samples.
5. Determination of acid number of given lubricating oil.
6. Determination of Strength of a strong acid by pH metric Method.
7. Conductometric determination of Strength of an Acid using strong base.
8. Conductometric determination of mixture of acids using strong base.
9. Determination of Total Hardness of water sample by using EDTA Method.
10. Colorimetric determination of Iron (III).
11. Potentiometric determination of Mohr's salt using $K_2Cr_2O_7$.
12. Potentiometric determination of strong acid using strong base.
13. Determination of manganese dioxide in manganese ore (pyrolusite).
14. Estimation of Viscosity of an Organic Solvent by using Ostwald Viscometer.
15. Preparation and calculation of the yield of Phenol-Formaldehyde Resin (Bakelite).

TEXT BOOKS:

1) "Practical Engineering Chemistry" by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2) "Lab Manual on Engineering Chemistry" by Sudharani, Dhanpat Rai Publications, Co., New Delhi., (2009).

REFERENCE BOOKS:

1. "Engineering Chemistry Lab Manual" by Shuchi Tiwari (2010), SCITECH Publications.
2. "Vogel's Text Book of Quantitative Chemical Analysis", 6th Edition by G. J. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3. "A Text Book of Engineering Chemistry" by R. N. Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4. "A Text Book on experiments and calculations Engineering" by S.S. Dara, S.Chand & Company Ltd. (2003).
5. "Instrumental methods of Chemical Analysis", Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

ELECTRONIC DEVICE LABORATORY

Subject Code: 16EC1101 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives

- To measure the voltage, current and frequency using CRO.
- To observe experimentally the V-I characteristics of PN junction diode & zener diode.
- To observe experimentally the V-I characteristics of BJT in CB,CE and CC configuration.
- To observe experimentally the V-I characteristics of FET.

Course Outcomes

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

CO1: Determine the voltage, current and frequency using CRO.

CO2: Draw the characteristics of PN Diode and Zener Diode.

CO3: Explain the characteristics of transistor in CB, CE and CC configurations.

CO4: Compute the V-I characteristics of JFET.

LIST OF EXPERIMENTS:

PART A: (Only for viva voce Examination)

1. Identification and specifications of R, L, C Components (Colour Codes), potentiometers and gang condensers.
2. Identification and working of switches (SPDT, DPDT, and DIP), relays, microphones and loud speakers.
3. Identification and utility of bread boards and single layer and multi layer PCBs.
4. Study and operation of voltmeters and ammeters and multimeters (Analog and Digital)
5. Study and operation of function generators and regulated power supplies.
6. Identification, Specifications and Testing of Active Devices: Diodes, BJTs, JFETs, LEDs, SCR and UJT.
7. Study of cathode ray oscilloscope (CRO).
8. Soldering practice – simple circuits using active and passive components.

PART B: (For Laboratory examination)

1. Measurement of voltage, current and frequency using cathode ray oscilloscope (CRO).
2. PN Junction diode forward and reverse bias characteristics.
3. Zener diode characteristics.
4. Transistor CB characteristics (Input and Output).
5. Transistor CE characteristics (Input and Output).
6. Transistor CC characteristics (Input and Output).
7. JFET characteristics. (Drain & transfer)

COMPUTER PROGRAMMING LAB

Subject Code: 16CS1101 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

Course Outcomes

At the end of the course students will be able to

CO1: Solve the given problem using the syntactical structures of C language

CO2: Develop, execute and document computerized solution for various problems using the features of C language

CO3: Design programs involving decision structures and loops.

CO4: Implement modularity and code reusability concepts using functions.

C05: Read and write C program that uses pointers, structures and files.

LIST OF EXPERIMENTS

Ex 1: Write the C programs calculate the following

a) Area of triangle when sides are given.
b) Sum of first n numbers.
c) Interchanging values of two variables.

Ex 2: Write the C programs to perform the following

a) Read lower case character and convert into upper case.
b) Find maximum of 3 values using conditional operator.
c) Calculate area and perimeter of circle.

Ex 3: Write C programs for the following using decision making statements

a) Check the given number is even / odd.
b) Find the Largest among 3 values.
c) Calculate the grades of a student.

Ex 4:

a) Arithmetical operations using switch-case.
b) Read a number and display in reverse.
c) Check for Armstrong number property

Ex 5:

a) Check for strong number property
b) Generate Fibonacci series.
c) Generate Prime numbers between two numbers.

Ex 6: Implement the following using arrays

a) Largest and smallest from a list of elements.
b) Find the position of given element from a list.
c) Arrange the elements in order.

Ex 7: Implement the following using arrays

a) Matrix addition.
b) Matrix Multiplication.
c) Transpose of given matrix

Ex 8: Calculate ${}^{n}C_{r}$ value using functions.

Write functions to perform

a) String copy
b) String concatenation
c) String comparison

Ex 9:

a) Factorial using recursion and non recursion.
b) GCD using recursion and non recursion.

Ex 10:

a) Find the sum and average of list of elements using DMA Functions
b) Implementation of call by reference

Ex 11:

a) Implementation of array of structure.
b) Demonstration of Union.

Ex 12:

a) Copy the contents of one file into another.
b) Count the number of characters, words and lines in a file.

Text Books:

1. E. Balaguruswamy "C Programming", , Tata Mc Graw Hills
2. Yashwant Kanikar "Let Us C".

Reference Books:

1. Dr. N.B Venkateswarlu "C and Data Structures: A snap shot Oriented Treatise Using Live Engineering Examples", by , S. Chand & Co, New Delhi.
2. B. W Kernighan, Dennis M. Ritchie, "The C – Programming Language",PHI.

SIGNALS AND SYSTEMS

Subject Code: 16EC2003 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives:

- Describe signals and systems in mathematical framework.
- Discuss the fundamental concepts of signals in Fourier domain.
- Demonstrate an understanding of the fundamental properties of Linear Time Invariant systems.
- Acquire knowledge on need of sampling, convolution and correlation concepts.
- Discuss the importance of Laplace and Z- Transforms.

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 and its properties, Inverse Z-Transform, simple mathematical problems and ROC.

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.
3. Charles L.Phillips, John M. Parr, Eve A. Riskin, "Signals, Systems, and Transforms", Pearson Publications, 4th Edition.

PULSE AND DIGITAL CIRCUITS

Subject Code: 16EC2004 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

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

Syllabus

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.

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, 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, Astable multivibrator as voltage to time converter

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.

Reference Books:

1. Pulse and Digital Circuits – Venkata Rao K., Ramasuda K., Manmadharao G., Pearson Education, 2010.
2. Pulse and Digital Circuits – MS Prakash Rao, Tata McGrawHill.

ELECTRONIC CIRCUITS – I

Subject Code: 16EC2006 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives:

- To study the concepts of rectifiers& filters.
- To understand the fundamentals of biasing of BJT & FET and its Stabilization.
- To understand the concept of h-parameters and able to analyze small signal model.
- To know the functionality of BJT & FET on Small signal model
- To point out different types of feedback amplifiers

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: Analyze the simplified h-parameter equations for BJT use an amplifier and also the fundamentals of miller theorem.

CO4: Operate BJT & FET on Small signal model.

CO5: Describe different types of feedback amplifiers.

Unit – I

Rectifier circuits: Half wave and Full wave rectifier circuits and analysis; Harmonic components in a rectifier circuit, ripple factor of half wave and full wave rectifiers.

Filters: Inductor filter, Capacitor filter, L – section filter, Π - section filter, Multiple L – section and Π - section filters; Comparison of filter circuits in terms of ripple factor.

Unit – II

Transistor Biasing and Stabilization: Operating point, basic stability; collector to base bias, self bias amplifiers. Stabilization against variations in V_{BE} and β for the self bias circuit. Stabilization factors (S, $S^{'}$, $S^{''}$).

Compensation circuits: Bias compensation, thermistor and sensistor compensation, compensation against variation in V_{BE}, I_{co}. Thermal runaway and Thermal stability.

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.

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: As voltage variable resistor, Small signal model of FET.

UNIT – V

Feedback Amplifiers: Introduction, Feedback concept, Transfer Gain with feedback, General characteristics of negative feedback amplifiers, Effect of Feedback on input and output Resistances of Feedback Amplifiers, Voltage series, voltage shunt, current series, and current shunt feedback amplifiers and their analysis. Method of Identifying Feedback Topology and Feedback Factor

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.

LINEAR CONTROL SYSTEMS

Subject Code: 16EE2005 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

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.

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 – Phase margin and Gain margin – Stability analysis from Bode plots.

Polar plots –Nyquist plots- Stability analysis.

Unit – V

Compensation techniques: Introduction – Lag, Lead, Lead – Lag compensators.

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams–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,TataMcGraw Hill Publications.

ELECTRICAL TECHNOLOGY

Subject Code: 16EE2006 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- This course deals with different types of DC machines which are widely used in industry and also their performance aspects will be studied.
- To acquire knowledge on principles and operation, construction, performance of transformers, induction motors and alternators.
- To understand the basic types and principles of laboratory instruments.

Course Outcomes:

At the end of the course the student will be able to
CO1: Discuss the operation and performance of DC machines.
CO2: Summarize the performance of transformers.
CO3: Discuss the operation and performance of induction motors.
CO4: Generalize the working principle and types of alternators.
CO5: Describe the working principle of measuring instruments.

Unit – I

DC Machines : Principle of operation of DC Machines – Construction, EMF equation – Types of generators – No load and Load characteristics of series and shunt generators**-**DC motor – Torque –Torque Speed characteristics of series and shunt motors–Losses and efficiency of DC Machines.

Unit – II

Single Phase Transformers: Principle of operation of single phase transformer – types – EMF equation- Phasor diagram on No Load and Full load – 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.

Unit – IV

Alternators: Alternators – constructional features – principle of operation – types – EMF Equation – predetermination of regulation by synchronous impedance method.

Unit – V

Electrical 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.

MATRICES AND APPLICATIONS
(Open Elective - I)

Subject Code: 16OE2011 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives

- To calculate the rank of a matrix and solve linear system of equations by different methods.
- Understand the concept of eigen values, eigen vectors of real and complex matrices, Cayley's Hamilton theorem and its applications.
- To solve linear system of equations by Numerical Methods.
- To acquire the knowledge of reduction of quadratic to canonical form and study its nature.
- To acquire the knowledge of matrix computations using mat lab.

Course Outcomes

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

CO1: Calculate the rank of a matrix and solve linear system of equations by different methods.

CO2: Calculate Eigen values, eigen vectors of real and complex matrices, apply Cayley's Hamilton theorem to calculate the powers and inverse of matrices.

CO3: Solve linear system of equations by LU –Factorization, Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization.

CO4: Deduce quadratic to canonical form by different methods.

CO5: Compute matrix operations using mat lab.

UNIT – I Matrices and Linear System of equations

Matrices-Rank of Matrix-By Definition-Echelon form, Normal form- PAQ form-Solution of homogeneous and non homogeneous Linear System of equations – condition of consistency - Direct methods- Gauss elimination, Gauss Jordan.

UNIT-II Eigen values and Eigen vectors

Eigen values - Eigen vectors – Properties – Cayley -Hamilton Theorem (without proof) - Inverse and powers of a matrix by using Cayley-Hamilton theorem.

Complex matrix-conjugate matrix – Hermitian and skew Hermitian matrix- eigen values and eigen vectors- properties.

UNIT-III Numerical Methods in Linear Algebra

Linear System : LU –Factorization , Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization.

UNIT-IV Quadratic forms

Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index – signature.

UNIT-V Computation by using MAT LAB

Solving a linear system, Gaussian elimination, Finding Eigenvalues and Eigenvectors.

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.
3. Getting Started with Mat Lab, Rudra Pratap, Oxford University press, 2014 print.
4. Advanced Engineering Mathematics, Erwin Kreyszig,8th Edition.

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.

INTRODUCTION TO MAT LAB
(Open Elective - I)

Subject Code: 16OE2013 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

By the end of this course, students in this class will understand the basic principles of programming and implementing mathematical concepts in MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations. The ultimate goal is to motivate the students for their profession and for future courses in curriculum.

Course Outcomes:

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

CO1: Translate mathematical methods to MATLAB code.
CO2: Generalize results and represent data visually.
CO3: Apply computer methods for solving a wide range of engineering problems.
CO4: Utilize computer skills to enhance learning and performance in other engineering and science courses.
CO5: Demonstrate professionalism in interactions with industry.

UNIT I
INTRODUCTION TO MATLAB

Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

UNIT II
DATA AND DATA FLOW IN MATLAB

Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

UNIT III
MATLAB PROGRAMMING

Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

UNIT IV
MATLAB ADVANCED

Plotting, Graphics, Creating Plot & Editing Plot, GUI(Graphical User Interface). MATLAB-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

UNIT V

SIMULINK

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

Text Books:

1. Getting Started With Matlab: A Quick Introduction for Scientists and Engineers (English) by Rudra Pratap, OXFORD University Press.
2. Matlab Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication

Reference Books:

1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang , Wenwu Cao, Tae- Sang Chung, John Morris.

FUNDAMENTALS OF MATERIAL SCIENCE
(Open Elective - I)

Subject Code: 16OE2014 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- To understand different engineering materials and their structures.

Course Outcomes:

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

CO1: Gain thorough knowledge in engineering materials and their structures.

Unit-I: Introduction

Introduction, classification of materials, crystal defects.

Unit-II: Plastic deformation of single crystals

Plastic deformation of single crystals. Deformation by slip. Deformation of single crystal. Deformation by twinning.

Unit-III:

Hot working, cold working. Recovery, recrystallization and grain growth. Solidification mechanism.

Unit-IV Mechanical properties

Mechanical properties. Tensile stress-strain diagrams, proof stress, yield stress diagrams, modules of elasticity. Hardness Testing: -Rockwell, Brinell and Vickers.

Unit-V Impact toughness, Charpy V-Notch, fracture, ductile, brittle, Griffith criteria for brittle failure, creep, creep mechanisms, fatigue-mechanism-factors to improve fatigue resistance

Text books:

1. An introduction to material Science – V Raghavan.
2. Mechanical Metallurgy – GE Dieter.
3. Material Science – Callister.

Reference books:

1. Material Science for Engineers – Vanvlack.
2. Material Science for Engineers – Schakleford.

UNIX UTILITIES
(Open Elective - I)

Subject Code: 16OE2016 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- State the major components and describe the architecture of the UNIX operating system
- Organize and manipulate files and directories
- Use UNIX utilities to create simple tools for the information processing
- Use I/O redirection, pipes, quoting, and filename expansion mechanisms.
- Develop the user interface menu system using shell scripting constructs.

Course Outcomes:

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

CO1: Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures with appropriate security.
CO2: Effectively use the UNIX system to accomplish typical personal, office, technical, and software development tasks.
CO3: Monitor system performance and network activities.
CO4: Effectively use software development tools including libraries, pre-processors, compilers, linkers, and make files.
CO5: Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.
CO6: Develop shell scripts to perform more complex tasks.

Unit-I:

UNIX Overview: What Is UNIX? History of UNIX, UNIX Philosophy, Why UNIX? , UNIX Components, System V vs. BSD, Comparing UNIX and Windows.
Getting Started: Logging on to the System, Your Home Directory, Using UNIX Commands, Special Characters, Terminal Control Keys, Changing Your Password, Getting Information, Logging off the System

Unit-II:

UNIX File systems: Hierarchical File Structure, File Types, File Names Pathnames, File and Directory Commands, Access Permissions, Standard UNIX File System
Editors: UNIX Editors, The Standard Display Editor - vi, vi Commands, Setting vi Options, pico: One Alternative to vi

Unit-III:

The Shell: What is the Shell?, Processes, Redirection, Pipes , Filters, Features (csh),Variables (csh), Initialization Files, Logout Files Electronic Mail: Electronic Mail Overview, Standard UNIX Mail, Sending Mail, Send Mode Commands, Reading Mail, Command Mode Commands, Saving Mail and Using Folders, Customizing Mail, pine: One Alternative to UNIX Mail

Unit-IV:

Common UNIX Utilities: Alphabetical List, Functional List Shell Scripts: What is a Shell Script? , Expressions, Control Structures, Miscellaneous.

Unit-V:

Network Related Utilities: talk, finger, ping, traceroute, ftp, telnet, rlogin, rsh, rcp X Windows Environment: What is X Windows? , Getting Started Using X Windows, Using the Window Manager, Customizing Your X Clients, Some Common X Clients

Text Books:

1. Sumitabha Das, 3rd Edition, UNIX the Ultimate Guide, TMH
2. Behrouz A. ForouZan, Richard F Gilberg, UNIX and Shell Programming, CENGAGE

Reference Books:

1. Dr. N B Venkateswarlu ,Advanced Unix Programming, , BS Publications

Reference Link :

http://parallel.vub.ac.be/documentation/linux/unixdoc_download/UnixIntro.html#Utilities.

IT SYSTEMS MANAGEMENT
(Open Elective - I)

Subject Code: 16OE2017 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- Provides extensive theoretical knowledge of IT infrastructure
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for an increasingly international business environment.
- Builds upon the essential core network and storage management with greater emphasis.

Course Outcomes:

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

CO1: Describe the business value and processes of ICT services in an organisation and apply that knowledge and skill with initiative to a workplace scenario
CO2: Analyze and evaluate the impact of new and current ICT services to an organisation;
CO3: Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organisation;
CO4: Characteristics of the network that affect user satisfaction.
CO5: Define, track, and maintain data and data resources.

Unit 1: IT Infrastructure: Overview

Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit 2: IT Infrastructure Management

Factors to consider in designing IT organizations and IT infrastructure, Determining customer's Requirements, Identifying System Components to manage, Data, applications, Tools and their integration, Patterns for IT systems management, Information Technology Infrastructure Library (ITIL).

Unit 3 Current computing environment

Complexity of current computing, multiple technologies, multiple vendors, multiple users, e-Waste disposal.

IT system Management: Common tasks in IT system management, approaches for organization Managemnt, Models in IT system design, IT management systems context diagram, patterns for IT system Management

Unit 4 Data communications and Network Management Overview

Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions.

Unit 5 Storage Management

Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery. Space management, Hierarchical storage management, Network attached storage.

Textbooks:

1. IT Infrastructure & Its Management,By Phalguni Gupta, Tata McGraw-Hill Education. (Unit 1, 2, 3, 5)
2. Network Management, Principles and Practice, Mani Subrahmanian, Pearson Education. (Unit 4)

References:

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009.
2. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

FUNDAMENTALS OF STRENGTH OF MATERIALS
(Open Elective - I)

Subject Code: 16OE2018 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- To study the elasticity and plasticity, types of stresses and strains, Hooke's law, working stress, factor of safety, lateral strain, poisson's ratio and volumetric strain
- To study the relationships between stress-strain of ductile and brittle materials, elastic moduli
- To study the beams and its supports, types, concept of S.F and B.M
- To study about S.F.D and B.M.D of cantilevers
- To study about S.F.D and B.M.D of Simply Supported beams

Course Outcomes:

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

CO1: understand the elasticity and plasticity, types of stresses and strains, Hooke's law, working stress, factor of safety, lateral strain, poisson's ratio and volumetric strain
CO2: understand the relationships between stress-strains of ductile and brittle materials, Elastic moduli
CO3: learn about the beams and its supports, types, concept of S.F and B.M
CO4: learn about S.F.D and B.M.D of Cantilevers
CO5: understand S.F.D and B.M.D of Simply Supported beams

Unit – I

Introduction: Elasticity and plasticity – Types of stresses and strains – Hooke's law - Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain

Unit – II

Relationships: Ductile materials and Brittle materials stress strain diagrams relationship, Elastic moduli and the relationship between them

Unit – III

Beams: Definition of beam –Types of supports - Types of beams – Concept of shear force (S.F.) and bending moment (B.M.)

Unit – IV

Cantilevers: Shear force and bending moment Diagrams for various types of loading which include point load and uniformly distributed load

Unit – V

Simply supported beams: Shear force and bending moment Diagrams for various types of loading which include point load and uniformly distributed load

Text Books:

1. Introduction to text book of Strength of materials by R.K.Bansal – Laxmi publications Pvt. Ltd., New Delhi.
2. Strength of materials by R. Subramanian, Oxford university press, New Delhi

Reference Books:

1. Strength of Materials by S. Ramakrishna and R.Narayan – Dhanpat Rai publications.
2. Strength of materials by R.K.Rajput, S.Chand & Co, New Delhi.

ELECTRONIC CIRCUITS – I LAB

Subject Code: 16EC2103 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives:

- To design rectifiers with filters and without filters.
- To design a common emitter amplifier and analyze the frequency response in both hardware and software
- To design a common collector amplifier and calculate gain,input and output impedence in both hardware and software
- To design the feedback amplifiers and calculate various parameters such as input impedance output impedance

Course Outcomes:

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

CO1: Construct the rectifiers with filters and without filters.

CO2: Obtain the Bandwidth of common emitter amplifier

CO3: Calculate the Gain, Input and Output resistances of common collector amplifier

CO4: Apply the concept of feedback to analyze feedback amplifiers.

Design and Simulation in Simulation Laboratory using Multisim (or) Pspice (or) Equivalent Simulation Software & verifying the result by hardware:

1. Half wave rectifier with and without filters.
2. Full wave rectifier with and without filters.
3. Common Emitter amplifier-Frequency response -3dB Bandwidth
4. Common Collector amplifier- i/p and o/p impedance gain measurement.
5. Current series feedback amplifier- Frequency response (with and without feedback)
6. Voltage series feedback amplifier- Frequency response (with and without feedback)

PULSE AND DIGITAL CIRCUITS LAB

Subject Code: 16EC2104 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

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.

NETWORKS AND ELECTRICAL TECHNOLOGY LAB

Subject Code: 16EE2103 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives:

- To understand the concepts of electric circuits and the performance characteristics of machines. This laboratory course will give a thorough knowledge about the basics of circuit analysis, D.C. & A.C. machines and transformers.

Course Outcomes:

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

CO1: Demonstrate different theorems for electrical circuits.

CO2: Estimate the bandwidth and Q factor of series and parallel circuits.

CO3: Analyze steady state analysis of A.C. circuits and two port networks.

CO4: Determine performance of D.C. machines.

CO5: Interpret performance of A.C. machines.

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

PART – A

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

PART – B

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

PROFESSIONAL ETHICS AND MORALS

Subject Code: 16HS2201 **Internal Marks: 0**
Credits: 0 **External Marks: 0**

Course Objectives:

- To help students regulate their behavior in a professional environment as employees.
- To make students aware of the impact of taking non-ethical engineering decisions.
- To understand that mind and desire control is needed for being ethical.
- To understand organizational culture and to adapt to varying cultures without compromising ethical values.

Course Outcomes:

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

CO1: Realize the importance of human values.

CO2: Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress.

CO3: Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices.

CO4: Assess the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists.

CO5: Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design, King fisher Airlines financial misappropriation.

Unit I

INTRODUCTION TO TERMINOLOGY IN ETHICS:

Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others – Work culture, Social responsibility, Responsibilities as a citizen, Cooperation and commitment – Religion vs. Spirituality, Philosophy, Customs and practices – Self-interest, Fear, Deception, Ignorance, Ego, Uncritical acceptance of authority.

Unit II

MIND AND ITS MYSTERIES:

What is Mind? Mind and body, Mind and food – Mental faculties – Theory of perception, Memory, Imagination, Thought-Culture, Desires – Cultivation of Virtues, Control of Senses and Mind – Concentration, Meditation and Enlightenment.

Unit III

RISK AND SAFETY IN ENGINEERING:

Estimating risk – What is acceptable risk? – Engineer's liability, Changing legal rights of the employees by non-participation, by protest – Environmental laws and judicial intervention in related matters.

Unit IV

NON-ETHICAL PRACTICES IN VOGUE:

Conflict of Interest, Occupational crime – How multinational corporations influence government decisions, public policy – Engineers as managers, advisors and experts,

Engineers as moral leaders – Problem of bribery, extortion, grease payments, nepotism – Nexus between politicians and industrialists.

Case Study: Chinese Minister Sentenced to Death for Corruption.

Unit V

CASE STUDIES – VARIETY OF MORAL ISSUES IN PROFESSION:

Chernobyl nuclear disaster, Fukushima reactor meltdown, Challenger blowup, Ford Pinto design, Highway safety, Kingfisher Airlines financial misappropriation.

Text books:

1. Engineering Ethics, Charles E Harris, Micheal J Rabins, Cengage Learning Pub.
2. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw Hill Pub.
3. Mind, Its Mysteries and Control, Swami Sivananda, Divine Life Society Pub.

ANALOG COMMUNICATIONS

Subject Code: 16EC2007 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

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 modulation techniques.

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: Introduction, Spectral Analysis of Sinusoidal FM and PM signals, Differences between FM and PM signals, Narrow band FM, Wide band FM, 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, Super heterodyne receiver, Communication Receiver, FM Receiver, Comparison with AM Receiver.

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 in 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. Principles of Communication Systems – H Taub and D. Schilling, TMH, 2007, 3/e.

Reference Books:

1. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004.
2. R.P. Singh, S.D Sapre, “Communication Systems”, 2nd Edition, TMH, 2007.
3. Communication Systems – B.P. Lathi, BS Publication, 2006.

ELECTROMAGNETIC FIELD THEORY AND TRANSMISSION LINES

Subject Code: 16EC2008 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

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 demonstrate the completeness of Maxwell's relations for describing electromagnetic fields.
- 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, magneto static and electromagnetic field problems.
CO2: Analyze the interaction of electromagnetic fields in different media.
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, Charge Distributions, Electric Flux Density, Gauss Law, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density. Convection and Conduction Currents, Dielectric Constant, Continuity Equation, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors.

Unit – II

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

Unit – III

Maxwell's Equations for 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.

Unit – IV

Time Varying EM Waves : Medium Characterization ,Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H. Wave Propagation in Lossless ,Conducting Media, Good Conductors and Good Dielectrics.
Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, Brewster Angle, Critical Angle and Total Internal Reflection, Poynting Theorem, Polarization.

Unit – V

Transmission Lines: Types, Parameters, Line Equations, Primary & Secondary Constants, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Condition for Distortion. Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ /2, λ/8 Lines, Smith Chart, stub matching.

Text Books:

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 2001, 3/e.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 2006, 7/e.
3. Electromagnetic Field Theory and Transmission Lines – Gottapu SashibhushanaRao Wiley India PVT.LTD. New Delhi, 1/e.
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2001

Reference Books:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2000, 2/e.
2. Schaums Outline Series – Electromagnetics – Joseph A Edminister, Tata Mcgraw Hill, 3/e.

ELECTRONIC CIRCUITS – II

Subject Code: 16EC2009 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives:

- Apply the concept of feed back to the Oscillators
- Introduce concepts in Cascading in BJT and FET amplifier
- Understand the high frequency Analysis of BJT.
- 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: Examine the application of positive feedback as an oscillator

CO2: Extrapolate BJT and FET amplifier used for cascading stages.

CO3: Analyze BJT at high frequency model

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

Oscillators: Introduction, Condition for oscillations, Barkhausen Criterion. RC oscillators: RC-phase shift oscillators, Wien bridge oscillator, LC Oscillators: Hartley, Colpitts and Crystal oscillators. (Frequency of oscillation derivation for both RC&LC Oscillators)

Unit – II

Multistage Amplifiers: Cascading transistor amplifiers, Coupling Methods, choice of transistor configuration in cascade amplifier, frequency response and analysis of two stage RC coupled Amplifier, Cascade Amplifier, Cascode Amplifier, Darlington pair, JFET amplifiers (only CS).

Unit – III

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.

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, 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, Simple regulator circuits using Zener diode; Transistor Series voltage regulator , Transistor shunt regulator.

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.

DIGITAL ELECTRONICS

Subject Code: 16EC2010 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives:

- To solve a typical number base conversions and analyze new error coding techniques
- To optimize logic gates for digital circuits using various techniques
- To understand concepts of Adders and Subtractors.
- To analyze different types of decoders, encoders, code converters, multiplexers and comparators
- To develop advanced 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: Use the concept of Boolean algebra in minimization of switching functions

CO3: Design different types of Adders and Subtractors

CO4: Design different types of decoders, encoders, code converters, multiplexers and comparators

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 and correction codes, Parity checking codes, Hamming codes.

Unit – II

Logic operations: Logic gates, Boolean theorems, complements and dual of logic expressions, standard SOP and standard POS. Minimization of logic functions using theorems. Multi level NAND – NAND, NOR – NOR realizations.

Minimization of switching functions: Minimization of switching functions using K – map up to 5-variables and, tabular minimization, code converters.

Unit – III

Combinational logic circuits-I: Design of half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, BCD adder, excess – 3 adder, carry look ahead adder.

Unit – IV

Combinational logic circuits-II: Design of decoder, encoder, code converters, multiplexer, de-multiplexer, priority encoder, comparators and LED seven segment display.

Unit – V

Sequential logic circuits: Classification of sequential circuits, flip-flops with truth tables and excitation tables. Conversion of flip-flops. Design of ripple counters, synchronous counters, Design of shift registers, buffer shift register, bi – directional shift register and universal shift register. Johnson and ring counters.

Text Books:

1. Switching and Finite automata theory – Zvi Kohavi, Tata Mcgraw – Hill, 1978, 2/e.
2. Digital Systems: Hardware Organization and Design, 3rd Edition -Frederick J. Hill, Gerald R. Peterson

Reference Books:

1. Digital design – Moris Mano, PHI, 2/e.
2. Fundamentals of Logic Design – Charles H.Roth Jr, Jaico Publishers.

RANDOM VARIABLES AND STOCHASTIC PROCESSES

Subject Code: 16EC2012 **Internal Marks: 30**
Credits: 2 **External Marks: 70**

Course Objectives:

- To provide mathematical background of probability to solve probabilistic problems in signal processing and communication.
- To study the concept of random variables and operations on random variable.
- 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 and application to the signal processing in the communication system.

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 random variable to multiple random variables.
CO4: Understand random process and its temporal characteristics.
CO5: Discriminate the power spectrum estimation in time and frequency

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, Independent Events.

Unit- II

Random variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables

Operation on One Random Variable Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Characteristic Function.

Distribution & Density Functions: Uniform, Gaussian and binomial density functions.

Unit-III

Multiple random variables: Vector random variables, joint distribution function, properties of joint distribution, marginal distribution functions, conditional distribution, density functionsd, statistical independence and sum of two random variables.

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

Unit – IV

Random Processes – Temporal Characteristics: The random process concept, ,classification of processes, Deterministic and Nondeterministic processes, 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 function and its properties,

Unit – V

Random Processes – Spectral Characteristics: Power spectrum Properties, Relationship between power spectrum and autocorrelation function, cross – power density spectrum and its properties.

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.

RENEWABLE ENERGY SOURCES
(Open Elective - II)

Subject Code: 16OE2023 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

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.
- T o 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:

After completion of this course, the student will 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, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation.

Unit-II
SOLAR ENERGY COLLECTION, STORAGE AND APPLICATIONS
Flat plate and concentrating collectors, Different methods of storage -Sensible, latent heat. Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

Unit-III
WIND AND BIOMASS ENERGY:
Sources and potentials, horizontal and vertical axis windmills. Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield, I.C.Engine operation and economic aspects.

Unit-IV

GEOTHERMAL AND OCEAN ENERGY: Resources, types of wells, methods of harnessing the energy. OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques,

Unit-V

DIRECT ENERGY CONVERSION:

Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems. Fuel cells, principles, faraday's law's.

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

PRINCIPLES OF MECHANICAL MEASUREMENTS
(Open Elective - II)

Subject Code: 16OE2024 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- To provide knowledge on static, dynamic behavior of measuring instruments and get the concepts of physical quantity measurement like pressure.
- To provide knowledge on measuring techniques for physical Quantity like pressure and flow.
- To provide knowledge on measuring techniques for temperature.
- To provide knowledge on measuring techniques for displacement.
- To provide knowledge on measuring techniques for mechanical quantities.

Course Outcomes:

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

CO1: Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error.
CO2: Measure pressure and flow using appropriate instruments
CO3: Measure temperature using different transducers.
CO4: Measure Displacement and Acceleration using appropriate devices.
CO5: Measure force, torque speed and power using suitable instruments

Unit- I

INTRODUCTION TO MEASUREMENTS: Basic functional descriptions of measuring instrument with examples, static and dynamic characteristics of measuring instrument.

Unit- II

PRESSURE: classification of mechanical pressure gauges, working principles.
FLOW: Rota meter, magnetic flow meter, hot-wire anemometer, ultrasonic flow meter.

Unit- III

TEMPERATURE: classification of temperature measuring methods according to their range of operation, working principles low temperature measurement and high temperature measurement techniques.

Unit- IV

DISPLACEMENT: principle and operation of resistive, inductive, capacitive displacement transducers.

Unit- V

FORCE, TORQUE, POWER, SPEED: Elastic force meter, load cells, Torsion meter, dynamo meter, stroboscope

Text books:

1. Measurement Systems: Applications & design by D.S Kumar.
2. Mechanical Measurements / BeckWith, Marangoni,Linehard, PHI / PE

Reference books:

1. Measurement systems: Application and design, Doblin Earnest. O. Adaptation by Manik and Dhanesh/ TMH
2. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.

INTRODUCTION TO JAVA
(Open Elective - II)

Subject Code: 16OE2026 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives

- Be able to explain the difference between object oriented programming and procedural programming
- Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm
- Cover issues related to the definition, creation and usage of classes, objects and methods.
- Discuss the principles of inheritance and polymorphism and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces.

Course Outcomes

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

CO1: Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
CO2: Identify classes, objects, members of a class and the relationships among them needed for a specific problem
CO3: To demonstrate the ability to understand and use Exception handling and file handling mechanism
CO4: Arrange the concrete and abstract classes in an appropriate hierarchy.
CO5: Develop efficient Java applets and applications using OOP concept

Unit-I:

Introduction: 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.

Unit-II:

Classes and Objects : Concepts of classes and objects, class fundamentals Declaring objects, introducing methods, constructors, usage of static with data and methods, 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, defining an interface, implementing interface, applying interfaces.

Unit-IV

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions.

Unit-V: Multithreading

Concepts of Multithreading, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities.

Text Books:

1. Herbert Schildt, the Complete Reference Java J2SE 5th Edition TMH Publishing Company Ltd, New Delhi.
2. Dr. N.B. Venkateswarlu, Dr. E.V. Prasad, Learn Object Oriented Programming Using Java: An UML Treatment using Live Examples from Science and Engineering, S Chand, New Delhi.

Reference Books:

1. H.M.Dietel and P.J.Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI
2. Cay.S.Horstmann and Gary Cornell, Core Java 2, Vol 2, Advanced Features, Seventh Edition, Pearson Education.
3. Iver Horton, Beginning in Java 2, Wrox Publications.
4. Somasundaram, Java, Jaico.

Reference Link: http://java.sun.com/tutorial

INTRODUCTION TO PYTHON
(Open Elective - II)

Subject Code: 16OE2027 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives

- Help students (who may /may not intend for CS&IT) to feel justifiably confident of their ability to write small programs.
- To provide the basic features of python programming language.
- To make students so that they can compete for jobs by providing competence & confidence in computational problem solving.
- Prepare students from other streams to make profitable use of computational methods in their chosen field.
- Prepare students who have prior programming experience or knowledge of computer science for an easier entry into computer science major.

Course Outcomes

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

CO1: Be fluent in the use of procedural statements — assignments, conditional statements, loops, method calls — and arrays.

CO2: Identify or characterize or define a problem.

CO3: Design, code, and test small Python programs that meet requirements expressed in English. This includes a basic understanding of top-down design.

CO4: Understand the concepts of object-oriented programming as used in Python: classes, subclasses, properties, inheritance, and overriding.

Unit I:

Client /Server environment, Introduction to Python, History, features, python environment setup, Basic syntax, using command interpreter, Variable and Data Types, Basic data types in Python, script structure.

Unit II:

Conditional statements, Boolean expressions, Looping Control Structures, Control Statements: Break, Continue, Pass.

Unit III:

Python sequences: strings, Lists, Tuples, dictionaries, sets., string manipulation, functions, modules & import.

Unit IV:

Errors and Exceptions, Handling exceptions, Files, File input/output, Text processing, file functions.

Unit V:

Object oriented programming: Class, object, Object Oriented Programming concepts.

Text Books:

1. Wesley J. Chun "Core Python Programming", Second Edition, Prentice Hall
2. Allen Downey, "Think Python", Second Edition , Green Tea Press

Reference Books:

1. Introduction to Computation and Programming Using Python, Spring 2013 Edition, By John V. Guttag.
2. Programming in Python 3: A Complete Introduction to the Python Language (Developer's Library), by Mark Summerfield, 2nd Edition.

COMPLEX VARIABLES
(Open Elective - II)

Subject Code: 16OE2028 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives

- To test if a function is analytic via the Cauchy-Riemann equations, harmonic and then find a harmonic conjugate.
- To evaluate complex integrals using the Cauchy Integral Theorems.
- To identify, classify zeros and singular points of functions, and find Laurent series expansion of complex functions for suitable region of convergence.
- Calculate the residues by Residue theorem, by Laurent's series.
- To evaluate contour integrals using the Residue theorem.

Course Outcomes

On completion of this course, students should be able

CO1: Analyze whether a function is analytic or not, check for a harmonic function and find a harmonic conjugate via the Cauchy-Riemann equations.
CO2: Evaluate complex integrals using the Cauchy Integral Theorem and formulae.
CO3: Identify, classify, zeros and singular points of functions, and find Laurent series expansion of complex functions for different region of convergence.
CO4: Calculate the residues by Laurent Series, residue theorem.
CO5: Apply residue theorem to evaluate various contour integrals.

UNIT-I

Complex Functions:

Functions of a complex variable-Continuity-Differntiability-analyticity-Properties-Cauchy-Reimann equations in Cartesian and polar coordinates (with out proof).Harmonic and conjugate harmonic functions-Milne-Thompson method.

UNIT-II

Complex Integration:

Line Integral in complex plane-Cauchy's integral theorem-Cauchy's integral formula-Generalized Cauchy's integral formula.

UNIT-III

Laurent's Series, Singularities, Zeroes and Poles:

Power series-radius of convergence of power series-Laurents Theorem-Laurents Series.
Singular point-isolated singularity- essential singularity -zeros-pole–simple pole-poles of order m.

UNIT-IV

Residues:

Residues-Evaluation of residue by formulae and by Laurent series-Residue theorem-evaluation of Integrals using Residue Theorem.

UNIT-V

Contour Integrals:

Evaluations of integrals of the type improper real integrals (a) $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{C}^{C+2\pi} f(\cos\theta, \sin\theta)d\theta$ (c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ (d) Integrals by indentation.

Text Books:

1. Engineering Mathematics Volume-III, T.K.V.Iyengar, B.Krishna Gandhi and Others, S.Chand & Company, 2010 reprint.
2. Higher Engineering Mathematics B.S.Grewel.

Reference Books:

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt.Ltd.
2. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.

REMOTE SENSING
(Open Elective – II)

Subject Code: 16OE202A **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- To study the basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum
- The study about the sensors and their types
- To study the platforms and their types
- To study the image analysis
- To study about the image classification

Course Outcomes

On completion of this course, students should be able to:

CO1: Understand the basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum
CO2: Understand about the sensors and their types
CO3: Learn about platforms
CO4: Learn about the image analysis
CO5: Understand the image classification

Unit I

Introduction: Definition**,** Basic components of remote sensing, Electromagnetic radiation, Electromagnetic spectrum

Unit II

Sensors: Introduction, Sensors- Passive sensors, Active sensors

Unit III

Platforms: Introduction, Platforms-Airborne remote sensing, Space borne remote sensing

Unit IV

Image Analysis: Introduction, elements of visual interpretations, image enhancement

Unit V

Image classification: Introduction, supervised classification, unsupervised classification

Text Books:

1. Remote Sensing and its applications by LRA Narayana University Press 1999.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy, B.S.Publications.

References:

1. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
2. Introduction to Remote Sensing by James B. Campbell and Randolph H. Wynne.

ANALOG COMMUNICATIONS LAB

Subject Code: 16EC2105 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

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
- Demonstrate the action of PLL

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 Analyzer
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.

Note: **Any five experiments are to be completed by using MATLAB**

DIGITAL ELECTRONICS LAB

Subject Code: 16EC2107 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives:

- Verify the truth tables of logic gates
- Design and verify the operation of combinational circuits.
- Design and verify the operation of sequential circuits
- Verify the operation of Johnson/ring counter

Course Outcomes:

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

CO1: Distinguish logic gates for design of digital circuits
CO2: Design different types of Combinational logic circuits
CO3: Analyze the operation of flip-flops
CO4: Apply knowledge of flip-flops in designing of Registers and Counters

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

1. Verification of logic Gates
2. Half/Full Adder/Subtractor
3. Parallel Adder/Subtractor
4. Excess-3 to BCD & Vice Versa
5. Binary-Gray & Gray-Binary Converter
6. MUX/DEMUX
7. MUX/DEMUX using NAND Gates only
8. Comparators
9. Encoder/Decoder
10. Flip-Flops
11. Counters
12. Shift Registers
13. Johnson/Ring Counters

ELECTRONIC CIRCUITS – II LAB

Subject Code: 16EC2108 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives:

- To design RC phase shift oscillator using transistors for different frequencies
- To design Wien Bridge oscillator using transistors for different frequencies
- To obtain frequency response of two stage RC coupled amplifier
- To design single tuned amplifier
- To design series and shunt voltage regulator

Course Outcomes:

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

CO1: Construct the RC phase shift oscillator using transistors for different frequencies
CO2: Design Wien Bridge oscillator using transistors for different frequencies
CO3: Estimate frequency response of two stage RC coupled amplifier
CO4: Calculate the resonant frequency of single tuned amplifier
CO5: Draw the characteristics of series and shunt voltage regulators

Design and Simulation in Simulation Laboratory using Multisim / Pspice / Equivalent Simulation Software & verifying the result by hardware:

1. RC Phase Shift Oscillator using Transistors - Design for different frequencies
2. Wien Bridge Oscillator using Transistors- Design for different frequencies
3. Two Stage RC Coupled amplifier – Frequency response
4. Single Tuned Voltage Amplifier
5. Zener diode as a voltage regulator
6. Series Voltage Regulator
7. Shunt Voltage Regulator

SELF STUDY COURSE – I

Subject Code: 16EC2201 **Internal Marks: 30**
Credits: 1 **External Marks: 70**

- 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) DATA BASE MANAGEMENT SYSTEMS:

Database System Applications, Data Base System VS File System – Views of Data – Data Abstraction –Instances and Schemas – Data independence ,Data Models – The ER Model – Relational Model – Other Models – Database Languages – DDL – DML – Database Access for applications Programs – Data Base Users and Administrator , Data Base System Structure.

Database Design and ER Diagrams – Beyond ER Design -Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Conceptual Design with the ER Model – Conceptual Design for Large enterprises. Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Logical Database Design – Introduction to Views – Destroying /altering Tables and Views.

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.

3) COMPUTER NETWORKS:

Data Communication, components, data representation, data flow; Networks: distributed processing, network criteria, physical structures, network models, categories of network, inter connection of networks; The Internet: brief history, internet today, Protocols &standard layers: protocols, standards standard organization, internet standards, Layered Tasks: sender, receiver, carrier, hierarchy.

The OSI models: layered architecture, peer to peer process, encapsulation, Layers in OSI model: physical layer, data link layer, Network layer, transport layer, session layer , presentation layer , application layer , TCP/IP protocol suite: physical and data link layers, network layer, transport layer, application layer, Addressing: physical address, logical address, port address, specific address..

4) DATA STRUCTURES

Introduction to data structures, singly linked lists, doubly linked lists, circular list, representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation.

Trees- Binary tress, terminology, representation, traversals, graphs- terminology, representation, graph

Traversals (dfs & bfs)

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.

DIGITAL COMMUNICATIONS

Subject Code: 16EC3013 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

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: Summarize Digital Communication system and various digitization techniques to achieve minimum bandwidth requirement.

CO2: Classify digital modulation techniques and to compute probability of error using matched filter analysis.

CO3: Measure the digital information through mathematical modeling and utilize suitable source coding techniques based on requirements in digital system.

CO4: Learn error control capabilities of block codes, encoding and decoding of various block codes.

CO5: Design Convolution encoder and decoder.

Unit I

Introduction to Digital Communications: Elements of digital communication system. Advantages of digital communication system.

Digitization Techniques: PCM-Sampling, quantization and coding, quantization error, Companding. 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,QAM 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.

SourceCoding: Shannon's theorem, Shanon-Fanon 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.

LINEAR IC APPLICATIONS

Subject Code: 16EC3014 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives

- To introduce the basic building blocks of linear integrated circuits
- To explain the parameters of operational amplifiers
- To categorize the applications of op-amp
- To describe about ADC , DAC, active filters and oscillators
- To discuss the theory and applications of 555 timer, PLL and voltage regulators

Course Outcomes

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

CO1: To analyze the basic building blocks of linear integrated circuits and differential amplifiers based on voltage gain, input resistance and output resistance
CO2: Determine the characteristics and various parameters of op-amp
CO3: Design circuits using op-amps for various applications
CO4: Summarize the Performance of the D to A and A to D converters, active filters & oscillators
CO5: Design circuits using timers, PLL and voltage regulators.

Unit I

Integrated circuits: Classification, Package types and temperature ranges.

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

Operational amplifiers: block diagram, equivalent circuit, ideal voltage transfer curve, parameters, ideal and practical specifications, Open loop and closed loop Op-amp configurations.

Op-amp characteristics: DC characteristics: input bias current, input offset current, input offset voltage, thermal drift. AC characteristics: frequency response and slew rate. frequency compensation techniques.

Unit III

Linear applications of Op-amps: summing, scaling and averaging amplifier, integrator and differentiator, instrumentation amplifier, AC amplifier, V to I, I to V converters.

Non–linear applications of Op–amps: comparators, zero crossing detector, multivibrators, Schmitt Trigger, triangular wave generator, log and anti log amplifiers, sample& hold circuit.

Unit IV

Active Filters &oscillators: Introduction, Butterworth filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters, RC phase shift and wein bridge oscillators

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

Unit V

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

Phase Locked Loop: introduction, block diagram, VCO (566), 565 PLL, applications of PLL: frequency multiplication, frequency translation.

IC Voltage regulators: Three terminal fixed and adjustable voltage regulators.

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: 16EC3017 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives

- To explain the different logic families and their comparison.
- To design the different combinational logic circuits
- To explain the design considerations of different combinational circuits
- To know the design and analysis procedures for sequential circuits.
- To design different programmable logic devices and study the various memory devices with internal structures

Course Outcomes

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

CO1: Identify and distinguish the behavior of various logic families
CO2: Design and analyze the different combinational circuits with relevant IC's for various applications.
CO3: Design and analyze 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 internal structures

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, emitter coupled logic, comparison of logic families.

Unit II

Combinational Logic Design – I: Design and analysis procedures of decoders, encoders, multiplexers and de-multiplexers and comparators. Design considerations of the above combinational logic with relevant digital ICs.

Introduction to VHDL: Basic language elements, behavioral modeling, data type modeling, structural modeling, 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 priority encoder, cascading comparators and combinational multipliers. Design considerations of the above combinational logic with relevant digital ICs. VHDL modeling of adders, subtractors and combinational multipliers.

Unit IV

Sequential Logic Design: Latches and flip-flops, Synchronous and asynchronous counters, shift registers, introduction to synchronous design methodology, VHDL modeling of counters and shift registers.

Unit V

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

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.

MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE

Subject Code: 16HS3005 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

Course Objectives:

- To develop an understanding on law of demand, elasticity of demand and concept on demand forecasting techniques.
- To make an understanding on theory of production and cost analysis and its application in business.
- To develop an understanding of market structure, different types of competition and pricing strategies.
- To develop better understanding of principles of management, leadership style and social responsibility of an organization.
- To develop the understanding on the concept of marketing and human resource management.

Course Outcomes:

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

CO1: Help students to learn the overview of managerial economics and its applications.
CO2: Familiarize students with theory of production and cost concept.
CO3: Help students to understand the concept of market structures, types of competition and pricing strategies.
CO4: Enable students to understand the concepts of Management and organization, Leadership Styles and Social responsibilities of Management.
CO5: Enable Students to understand the concepts on Marketing and Human Resource Management.

UNIT I

Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Elasticity of Demand, Types, Demand Forecasting, Factors governing Demand Forecasting, Methods of Demand Forecasting viz. survey methods, statistical methods, expert opinion method, test marketing, controlled experiments.

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 & Implicit costs, Out of pocket & 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, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, 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, Promotion, Transfer, Separation, Performance Appraisal, 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.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Subject Code: 16EC3018 **Internal Marks: 30**
Credits: 2 **External Marks: 70**

Course Objectives:

- To study the performance characteristics of different electronic measuring instrument, its analysis and calibration techniques.
- To introduce Signal Generator and Wave Analyzers for analysis of EM spectrum.
- To deals about Oscilloscopes and internal circuitry for measurement of electronic parameters.
- To brief discussion about all AC bridges, design methods and its applications.
- To understand 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 is 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

CO5: Explain various types of transducers and their applications for measuring non-electrical parameters.

UNIT I

Performance characteristics of instruments: Static characteristics, dynamic characteristics

Basic meters: Voltmeter, voltmeter range extension, ammeter, ammeter range extension, Thermocouple type ammeter, ohm meter, Series type, shunt type.

UNIT II

Signal Generators: Fixed and variable, AF oscillators, standard and AF sine and square wave signal generators, function Generators.

Wave Analyzers: Harmonic distortion analyzers, spectrum analyzers and digital Fourier analyzers.

UNIT III

Special Oscilloscopes: Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital storage oscilloscope.

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.

UNIT V

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

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.

FUNDAMENTALS OF FUZZY LOGIC
(Common for all Branches)

Subject Code: 16OE3031 **Internal Marks: 30**
Credits: 2 **External Marks: 70**

Course Objectives
The student will be able to

- Understand the concepts of fuzzy sets, membership functions and their operations.
- Frame linguistic variables and analyze the fuzzy quantifiers.
- Frame simple fuzzy sets.
- Fuzzify any desired area of classical Mathematics using Fuzzy controllers.
- Apply the concepts of Defuzzification.

Course Outcomes

At the end of the course the student will be able to
CO1: Perform different fuzzy operations on fuzzy sets or membership functions.
CO2: Construct linguistic variables and estimate the fuzzy quantifiers as per the requirement.
CO3: Construct a simple Fuzzy set.
CO4: Develop simple Fuzzy expert system to Fuzzily any desired area with suitable controllers using different inference rules.
CO5: Apply defuzzification process to convert a Fuzzy set to a crisp value.

UNIT-I
Fuzzy set Theory
Crisp Sets- an overview, Fuzzy sets – membership functions -types of membership functions- Triangular, Trapezoidal, Gaussian-examples. Basic Fuzzy set operations- union, intersection, complement. Properties of Fuzzy Sets, Fuzzy relations – Cartesian product, operations on fuzzy relations.

UNIT-II
Fuzzy Logic
Classical Logic – an overview, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference.

UNIT-III
Construction of Fuzzy sets
Methods of construction –an overview, Direct methods with one expert, Direct methods with multiple experts, constructions from Sample data –examples.

UNIT-IV
Fuzzy Expert System - Fuzzification
Fuzzy Controllers, Fuzzy Expert System- Fuzzification- Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules.

UNIT-V

Fuzzy Expert System- Defuzzification

Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method-examples.

Text books:

1. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George. J. klir / Bo Yuan, Prentice-Hall of India Pvt Limited.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms, S.Rajasekharan, G.A.Vijayalakshmi Pai, PHI.

References

1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, 3rd edition, John wiley & sons Ltd.

ENVIRONMENTAL IMPACT ASSESSMENT

(Open Elective Course - III)

Subject Code: 16OE3032 **Internal Marks: 30**

Credits: 02 **External Marks: 70**

Course Objectives:

- To identity different methodologies for Environmental Impact Assessment (EIA).
- To understand the basic concept of EIA.
- To apply the professional knowledge of EIA to prepare Environmental audit report.
- To aim for employment in premier consultancy organization which are preparing EIA report to industries
- 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 is :

CO1: Able to Prepare EIA reports to industries.

CO2: Able to create awareness among the public on the effects of pollution at local level as well as global level.

CO3: Able to manage quality of soil, water & air by adopting environmental legislation

CO4: Able to get successful employment in organizations working for the protection of environment.

CO5: Able to prepare environmental audit report.

UNIT I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT II

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT III

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT IV

Environmental Audit, objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report. Post Audit activities.

UNIT V

Environmental legislation- The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.), Mota Act, Wild life Act- Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, KAKINADA.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

References:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

ENERGY AUDIT, CONSERVATION AND MANAGEMENT
(Open Elective Course - III)

Subject Code: 16OE3033 **Internal marks: 30**
Credits: 2 **External Marks: 70**

Course Objective:

- To introduce basic principles of energy auditing and to know something about energy management. Also it provides immense knowledge about energy efficient motors, power factor improvement, lighting and energy instruments. Finally economic aspects are analyzed.

Course Outcomes:

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

CO1: Apply principles of energy auditing and propose energy conservation schemes.
CO2: Demonstrate principle and organizing energy management program.
CO3: Demonstrate the operating principle of energy efficient motors.
CO4: Analyze power factor improvement methods, illumination methods and demonstrate the operation of various energy instruments.
CO5: Analyze and compute the economic aspects of energy consumption.

UNIT I: BASIC PRINCIPLES OF ENERGY AUDIT

Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes.

UNIT II: ENERGY MANAGEMENT

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

UNIT III: ENERGY EFFICIENT MOTORS

Energy efficient motors , factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

UNIT IV: POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS

Power factor – methods of improvement, location of capacitors. Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT V: ECONOMIC ASPECTS AND ANALYSIS

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis.

Text Books:

1. Energy Management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy Efficient Electric Motors by John. C. Andres, Marcel Dekker Inc. Ltd – 2nd Edition, 1995
3. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing Company Ltd, New Delhi.

Reference Books:

1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.

ELEMENTS OF WORKSHOP TECHNOLOGY
(Open Elective - III)

Subject Code: 16OE3034 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- To provide knowledge about the different manufacturing processes
- To impart knowledge on carpentry tools, operations and joints
- To understand the fitting tools, operations and joints
- To provide knowledge on forging tools, operations and joints
- To impart knowledge on sheet metal work tools, operations and joints

Course Outcomes:

On completion of this course, students should be able to

CO1: Comprehend different manufacturing processes.
CO2: Explain the carpentry tools and applications of carpentry joints.
CO3: Explain the fitting tools and operations.
CO4: Explain the forging tools and operations.
CO5: Explain the sheet metal tools and operations and applications.

UNIT I

Methods of manufacturing processes, casting, forming, metal removal processes, joining processes, surface finishing processes, basic workshop process, carpentry fitting, hand forging, sheet metal work, cold and hot working of metals.

UNIT II

CARPENTRY:

Marking & measuring tools, Cutting Tools: Saws, Chisels, Planes, Boring Tools, Striking tools, Holding devices, Carpentry joints: Half lap joint, Mortise and tenon joint, bridle joint, dovetail joint.

UNIT III

FITTING:

Marking & measuring tools, Holding Devices, Cutting tools: Hacksaw, Files, Chisels, Drill bits, Reamer, Taps, Dies & sockets, striking tools, Holding devices and Fitting Operations: chipping, filing, sawing, marking, drilling, reaming, tapping, dieing.

UNIT IV

FORGING:

Hand forging - Hand tools**:** Anvil, swage block, Tongs, hammers, Chisels, Swages, Fullers, flatters, set hammer, punches and drift, Forging operations: Upsetting, drawing down, setting down, punching and drifting, bending, welding, cutting, swaging, fullering and flattering.

UNIT V

SHEET METAL WORK:

Metals used for sheet metal work, Sheet metal hand tools: snips, stakes, hand hammers, mallets and Sheet Metal Operations: Shearing, bending, drawing, squeezing, Sheet metal joints-Hem joint, seam joint.

Text Books:

1. Elements of Workshop Technology S. K. Hajra Choudhury, A. K. Hajra Choudhury.
2. Workshop Technology B. S. Raghuwanshi Dhanpat Rai & Co.,

References Books:

1. Workshop Technology by Virender Narula Pub: S.K.Kataria & Sons

SOCIAL NETWORKS
(Open Elective course –III)

Subject Code: 16OE3036 **Internal marks: 30**
Credits: 2 **External Marks: 70**

Course Objectives:

The student should be made to:

- Introduce students to an academic understanding of social networks.
- Learn visualization of social networks.
- Define social networks and related terms.
- Understand the role of ontology in social networks.
- To be able to build web applications with social network features.
- Understand human behavior in social web and related communities,
- Understand the link between qualitative and quantitative methods of social network analysis.

Course Outcomes:

Upon completion of the course, the student should be able to:

CO1: Predict human behavior in social web and related communities.
CO2: Visualize social networks.
CO3: Able to discover the capabilities and limitations of Semantics for social networks
CO4: Understand how these Social technologies impact society and vice versa.
CO5: Develop skills, recognize, understand, and more effectively manage new social practices online.

UNIT I: Introduction To Social Networks And Semantic Web

Introduction to Social Networks – Emergence of the Social Web, Limitations of the Current Web, Development of the Semantic Web, the Semantic Solution.

UNIT II Social Network Analysis

Social Network analysis: What is Network analysis, Development of Social Network analysis, Key Concepts and Measures in Network analysis.

UNIT III: Web Intelligence

Web data and Semantics in Social Network applications – Electronic Sources for Network analysis: Electronic Discussion Networks, Blogs and Online Communities, Web based Networks.

UNIT IV: Knowledge Representation:

Knowledge Representation on the semantic web: Ontologies and their role in the Semantic web, Ontology languages for the semantic web.

UNIT V: Social Networks Analysis in The Sciences

History of Social Networks – Context, Methodology- Data acquisition, Representation, Storage and Reasoning, Visualization and analysis.

Text Books:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1 st Edition, Springer, 2010.
3. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.

Reference Books:

1. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.

Reference Link:

1. Burt, R. S. (1984). Network items and the General Social Survey. Social Networks 6, 293-340.

FUNDAMENTALS OF COMPUTER GRAPHICS
(Open Elective – III)

Subject Code: 16OE3037 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- To enlighten the working principles of display devices, and concepts of resolution.
- To understand the fundamental data-structures and algorithms used for output primitives.
- To design graphics programmes using mathematical and theoretical foundations.
- To hypothesize 3D models of objects.
- To organize steps and plan for generation of animations.

Course Outcomes:

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

CO1: Understand the working principles of display devices, and concepts of pixel, resolution.
CO2: Apply mathematics and logic to develop algorithms for various output primitives like lines, circles, polygons.
CO3: Learn to manipulate 2D pictures by designing various transformations.
CO4: Generate 3D computer graphics using interpolation and approximation functions. And derive Projection Transformations.
CO5: Detect visible surfaces using various routines, thus hiding back faces in 3D graphics, and generate Computer Animation.

UNIT I

Introduction: Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, input devices, Pixels and frame buffers

UNIT II

Output Primitives: Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

UNIT III

2-D Geometrical Transformations: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates.

UNIT IV

2-D Viewing: The viewing pipe-line, window, view-port, viewing transformation, Cohen-Sutherland, Sutherland-Hodgeman polygon clipping algorithm.

3D Graphics: 3D basic Transformations, Projections, curve generation, Hermite curve, Bezier curve and B-spline curve, B-spline surfaces.

UNIT V

Visible surface detection algorithms: Back-face, Z-buffer, Scan-line algorithm, Painter's algorithm, Animation

Text Books:

1. " Computer Graphics C version" Donald Hearn and M. Pauline Baker, Pearson/PHI
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

References:

1. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
3. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
4. Computer Graphics, Steven Harrington, TMH

DIGITAL COMMUNICATIONS LAB

Subject Code: 16EC3109 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

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: know the process of transmitting many signals through single channel and receiving data transmitted to corresponding at receiver side by Time Division Multiplexing (different time slots).

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 the source encoding algorithms.

CO5: Verify Linear Block Codes implementation..

CO6: Predict the outputs of Non Linear Block Codes (Convolution Code).

List of Experiments (Atleast 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. Amplitude Shift Keying
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

ECAD LAB

Subject Code: 16EC3110 **Internal Marks: 25**
Credits:1.5 **External Marks: 50**

Course Objectives:

- To examine the working of logic gates using IC'S and active HDL
- To describe the working of combinational circuits using IC'S and active HDL
- To understand the operation of flip-flops using IC'S and active HDL
- To develop the sequential circuits using flip-flops using IC'S and active HDL
- To analyze the operation of RAM using IC'S and active HDL

Course Outcomes

At the end of the course 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. Realization of Logic gates
2. D flip-flop-7474
3. Decade Counter -7490
4. 4 Bit counter -7493
5. Shift register -7495
6. Universal shift register -74194/195
7. 3 to 8 decoder - 74138
8. 4- bit comparator- 7485
9. 8x1 multiplexer & 2 x 4 Demultiplexer
10. RAM 16X4 – IC 74189(read and write operations)
11. Stack and queue implementation using RAM
12. ALU Design

LINEAR IC APPLICATIONS LAB

Subject Code: 16EC3111 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives

- Explain the specifications of various linear ICs
- Analyze and design various applications using Op-amp.
- Design and construct waveform generation circuits
- Obtain constant voltages using three terminal regulators

Course Outcomes

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

CO1: Identify specifications, functioning and parameters of IC 741, IC 555, IC 565, IC 566, and IC 1496.

CO2: Design and verify various applications of Op-amp.

CO3: Generate sine wave, Pulse wave and Square wave using op-amp and Timer circuits.

CO4: Produce constant voltages using three terminal 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 – Band pass 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 – 7805, 7809, 7912.

SELF STUDY COURSE-II

Subject Code: 16EC3202 **Internal Marks: 25**
Credits: 1 **External Marks: 50**

ANTENNAS AND WAVE PROPAGATION

Subject Code: 16EC3019 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

Course Objectives:

- To know the basic parameters of the antenna
- To calculate the field components of linear antennas using Maxwell's equations
- To differentiate the different antenna arrays and their characteristics.
- To explain the construction ,operation and design considerations of antennas at various frequency and their applications.
- To study the Characteristics and 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, E& H field patterns, retarded potentials, Radiation from small electric dipole, quarter wave monopole and half wave dipole – current distributions. Antenna theorems – applicability and proofs for equivalence of characteristics, loop antennas, short dipole.

UNIT II

Antenna arrays: Two element arrays – different cases, principle of pattern multiplication, N – element uniform linear arrays: broadside, end fire arrays and EFA with increased directivity, Derivation of their characteristics and comparison. Binomial arrays.

UNIT III

HF&VHF Antennas: Introduction, travelling wave radiators: basic concepts, long wire antennas: field strength calculations and patterns, V& Inverted V -antennas, rhombic antennas and design relations, Yagi - Uda antenna, folded dipole antenna and its characteristics, helical antennas: significance, geometry and basic properties.

UNIT IV

UHF, Microwave antennas and Measurements: Reflector antennas: flat sheet and corner reflectors. Parabolic reflectors: geometry, characteristics, types of feeds, off-set feeds and

Cassegrain feeds. Horn antennas: types and optimum horns. Lens antennas: geometry and features, introduction to Micro strip antennas.

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

UNIT V

Wave Propagation: Fundamental equation for free-space propagation and basic transmission loss calculations.

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

Sky Wave Propagation: Formation of ionosphere layers and their characteristics. Expression for refractive index, Critical frequency, Skip distance, MUF for flat and curved earths, Virtual height.

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.

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.
3. Antennas and Wave Propagation by GSN Raju, Pearson publications

MICROPROCESSORS AND MICROCONTROLLERS

Subject Code: 16EC3020 **Internal Marks: 30**
Credits: 3 .5 **External Marks: 70**

Course Objectives:

- To identify the components of the computer (CPU, Registers, Stack, Etc) and learn the architecture of 8086 microprocessor.
- To describe the instruction set and assembler directives of 8086 microprocessor.
- To learn the Architecture of 80386 and Pentium microprocessor.
- To interfacing I/O and advanced peripherals with 8086.
- To study the Architecture and Assembly Language Programming of 8051and PIC Micro controllers.

Course Outcomes:

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

CO1: Explain the architecture of 8086 family of microprocessors, interrupt structure and addressing modes.
CO2: Write programs in Assembly Level Language.
CO3: Differentiate the architecture of 80386 and Pentium Processors.
CO4: Interface IO and Advanced peripherals with 8086
CO5: Distinguish the architecture of 8051and PIC Micro controllers and can write Assembly Language Programs.

UNIT I

Microprocessor 8086: Review of 8085, Introduction, architecture, register organization, memory organization, signal description and pin diagram, addressing modes, classification of interrupts, interrupt service routine and interrupt vector table, timing diagrams of 8086.

UNIT II

Assembly Language Programming of 8086: Instruction set- Data Transfer instructions, Arithmetic, logical, Branch instructions, Flag manipulation instructions, machine control instructions , String instructions, assembler directives, procedures and macros, assembly language programs.

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 Pentium processor architecture.

UNIT IV

Interfacing with IO and Advanced devices: – Programmable Peripheral Interface (8255), modes of operation of 8255, interfacing 8255, Programmable interrupt controller (8259A), interfacing 8259A , Functional block diagram of 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, Assembly Language Programming 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. The 8051 Microcontroller – Kenneth J. Ayala

Reference books:

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

DIGITAL SIGNAL PROCESSING

Subject Code: 16EC3021 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

Course Objectives

- To study the different types of discrete time signals and systems.
- To define the DFS, DFT and FFT
- To provide a thorough understanding and working knowledge of design and implementation of digital IIR filters.
- To provide a thorough understanding and working knowledge of design and implementation of digital FIR filters.
- To introduce the concepts of DSP Processor and its architectures.

Course Outcomes

At the end of the course student will be able to:
CO1: Discriminate the discrete systems based on their basic properties
CO2: Determine the frequency response of different signals in Fourier domain.
CO3: Design IIR filters using different techniques
CO4: Design FIR filters using different techniques
CO5: Learn the basic architectural features of programmable DSP devices

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.
Z – Transform: Definition, properties, ROC, inverse Z-Transform.

UNIT II

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences.
Discrete Fourier transform: Computation of DFT, Properties of DFT, linear convolution of sequences using DFT, Relation between Fourier transform and Z-transform.

Fast Fourier Transform: Radix-2 decimation in time and decimation in frequency algorithms, inverse FFT and mixed radix algorithms.

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, 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), frequency transformation.

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.

UNIT V

Introduction to DSP Processors: Introduction, Digital signal-processing system. Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

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 Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 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.
3. Digital Signal Processors: Architecture, Programming and Applications, B. Venkataramani, M. Bhaskar, TMH Edition, 2002.

COMPUTER ORGANIZATION AND ARCHITECTURE

Subject Code: 16EC3022 **Internal Marks: 30**
Credits: 3 **External Marks: 70**

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 analyse processor performance improvement using parallel processing and multiprocessor

Course Outcomes:

At the end of the course student will be able to

CO1: Understand basic structure of digital computer and fixed, floating point data representations.
CO2: Compute arithmetic operations in algorithm format and explain its hardware implementation.
CO3: Discuss different types of control unit operations.
CO4: Distinguish different memories and their importance in digital computer operation and concept of I/O organization.
CO5: Understand parallelism in terms of a single processor and multiple processor and interconnection structure of multiprocessor.

UNIT I

Basic structure of computer: Functional units, Basic operational concepts, computer type, Bus structures, Performance, software, multiprocessor and multicomputer.

Register Transfer and Micro operation: Register transfer language, register transfer, bus and memory transfer, arithmetic micro operation, logic micro operation, shift micro operation and arithmetic logic shift unit.

UNIT II

Computer Arithmetic: Data representation fixed point representation and floating point representation, addition and subtraction with signed magnitude and signed 2's complement data, multiplication algorithms, division algorithms, floating point arithmetic operations. Decimal arithmetic unit BCD adder and subtraction, decimal arithmetic operations.

UNIT III

Memory organization: Memory hierarchy, Primary memory, Auxiliary memory, Associative memory, Cache memory: mapping functions, Virtual memory and Memory management hardware.

UNIT IV

Input-output organization: I/O interface. I/O Bus and interface modules, I/O versus Memory Bus, Isolated versus memory mapped I/O. Asynchronous data transfer, Modes of Transfer: Programmed I/O, Interrupt driven I/O, Direct memory Access: DMA controller and transfer.

UNIT V

Parallel Processing: Pipelining Arithmetic and Instruction Pipeline, Basics of vector processing and Array Processors.

Micro programmed Control: Basic Concepts, Microinstruction Sequencing, Micro instruction Execution.

Text Books:

1. Morris Mano, M., "Computer System Architecture," 3/e, Pearson Education, 2005.
2. Hamacher, Vranesic, Zaky, "Computer Organization," 5/e, McGraw Hill, 2007.

Reference Books:

1. William Stallings, "Computer Organization and Architecture: Designing for Performance," 7/e, Pearson Education, 2006.
2. John P. Hayes, "Computer Architecture and Organization," 3/e, TMH, 1998.
3. Govindarajulu, B., "Computer Architecture and Organization," 2/e, TMH, 2010.

OPTICAL COMMUNICATION & NETWORKS

(Elective –I)

Subject Code: 16EC3023 **Internal Marks: 30**

Credits: 3 **External Marks: 70**

Course Objectives

- To define the basic concepts and operating principles used in fiber optic communications technology.
- To develop an essential understanding of operation principles of fiber optic components
- To generalize the origin of loss and causes of various dispersion optical fibers.
- To describe a basic analog and digital signal sampling, transmission and receiving in communications.
- To know the design consideration 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 design parameters of optical networks and prepare power budget for an optical link.

CO5: Test 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- single and Multi, 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, Comparison 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 : 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. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.

Reference books:

1 .Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002
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)

TELECOMMUNICATION SWITCHING SYSTEMS

(Elective –I)

Subject Code: 16EC3024 **Internal Marks: 30**

Credits: 3 **External Marks: 70**

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 describe PSDN and 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 signaling techniques.
CO4: Illustrate the OSI reference model and various types of networks.
CO5: Interpret the concepts of PSDN and 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, centralized 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 dialling.

Signaling Techniques: In channel signalling, common channel signalling, Network traffic load and parameters, grade of service.

UNIT IV

Data Communication Networks:

Introduction, network architecture, protocols and standards, layered network architecture, OSI, serial and parallel data transmission, data communication circuit arrangements, data communications networks

UNIT V

PUBLIC SWITCHED DATA NETWORKS: valued added networks, circuit switching, message switching and packet switching.

INTEGRATED SERVICES DIGITAL NETWORK: principles, evolution, conceptual view, objectives, architecture, system connections and interface units, broadband ISDN

Text books:

1. Tele communication switching system and networks - Thyagarajan Viswanath, PHI, 2000.
2. Advanced electronic communications systems - Wayne Tomasi, 5th edition, Pearson

Reference books:

1. Data Communication & Networking - B.A. Forouzan, TMH, 3rd Edition, 2004.
2. Telecommunication switching, Traffic and Networks - J E Flood, Pearson Education.

BIO-MEDICAL INSTRUMENTATION

(Elective –I)

Subject Code: 16EC3025 **Internal Marks: 30**

Credits: 3 **External Marks: 70**

Course Objectives

- To expose the students to the basic concepts of Human systems and the problems encountered from living organisms. And To provide adequate knowledge about the sensors and transducers used in bio medial applications.
- To expose the students to know about the functioning of cardio vascular system.
- To provide adequate knowledge about functioning of Respiratory system and pace makers.
- To provide adequate knowledge about bio telemetric methods for patient care and monitoring.
- To provide adequate knowledge about the shock hazards and prevention methods in hospitals

Course Outcomes

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

CO1: Describe the physiological systems of the human body, Man-Instrumentation system and Bio electric potentials.
CO2: Discuss the cardio-vascular system, heart sounds
CO3: Discuss the Respiratory system, lung volumes and capacities, pace makers.
CO4: Discuss the different bio telemetric methods for patient care monitoring
CO5: Discuss about the analytical equipment and grounding methods for patient care monitoring.

UNIT-I:

Sources of Bioelectric potentials and Electrodes: Introduction to Man- Instrumentation system, Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, introduction to bio-medical signals.

UNIT-II:

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, ECG- lead configuration, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds.

UNIT- III:

Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring

equipment, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT-IV:

Bio telemetry and Instrumentation for the clinical laboratory Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care

UNIT-V:

X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy – Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention.

Text Books

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John willey & Sons Inc.

References

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH)
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson)

TRANSFORM TECHNIQUES
(Discipline Elective –I)

Subject Code: 16EC3026 **Internal Marks: 30**
Credits: 3 **External Marks: 7**

Course Objectives:

- To learn Time to Frequency domains in 1-D &2-D.
- To learn different transform techniques like DCT, Hadamard.
- To learn STFT.
- To learn filter banks, DWT.
- To learn about fractional Fourier transforms.

Course Outcomes:

At the end of the course the student will be able to:
CO1: Observe spectral analysis of signals based for different time domain signals.
CO2: Understand types of 1d and 2d transforms and their applications.
CO3: Understand the importance of the wavelet transform and its applications
CO4: Understand the concept on DWT techniques.
CO5: Acquired the fundamental of the fractional Fourier transforms

UNIT -I:

Fourier Analysis: Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform.

UNIT -II:

Transforms: Walsh, Hadamard , Haar and Slant Transforms, DCT, DST, KLT,– definition, properties and applications

UNIT -III:

Wavelet transforms-1: STFT, Short comings of STFT, Wavelet transforms- Introduction, definition, 1D&2D wavelet transform-time and frequency decompositions

UNIT -IV:

Wavelet transform-2:- Need for Scaling function – Multi Resolution Analysis, Two Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:

Fractional Fourier Transform: Introduction, definition, properties of Fractional Fourier Transform, Fractional kernel, interpretation of the fractional transform.

Text books:

1. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009
2. "Insight into Wavelets from Theory to Practice" - Soman. K. P, Ramachandran. K.I, Printice Hall India, First Edition, 2004.
3. Wavelet Transforms-Introduction theory and applications -Raghuveer M.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.

Reference books:

1. Fundamentals of Wavelets- Theory, Algorithms and Applications -Jaideva C Goswami, Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. Wavelets and Sub-band Coding -Vetterli M. Kovacevic, PJI, 1995.
3. Introduction to Wavelets and Wavelet Transforms -C. Sydney Burrus, PHI, First Edition, 1997.
4. A Wavelet Tour of Signal Processing-Stephen G. Mallat, Academic Press, 2 Ed

MANAGEMENT INFORMATION SYSTEMS (MIS)
(Open Elective - IV)

Subject Code: 16OE3041 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course OBJECTIVES:

- To gain knowledge on formulation and implementation best practices on technology management policies by managers.
- To identify the crucial indicators related to process management and channels of technology flow for the development of the organization.
- To identify and implement the innovation factor in every process for enhancing cutting-edge performance by the organizations.
- To understand the usage of information systems in the functional areas of business.
- To develop the skill in the key areas of system planning, analysis and design.

Course OUTCOMES:

CO1: Students will able to adapt an experiential learning perspective in the stream of information technology.
CO2: Students will be able to act autonomously in planning, implementing and reflecting at a professional level, on the development and use of technology to address organizational problems.
CO3: Students will be able to augment analytical and reflective skills in decision making.
CO4: Students will be able to acquire knowledge of the functional areas of business and the interrelationships among the functional areas within a business.
CO5: Enable students to develop their skill in the key areas of system planning, analysis and design.

UNIT 1: Management Information Systems
MIS -Management Information systems-Concept- Nature, Importance and Scope of MIS-Structure of MIS-MIS Classification- Types of Information- Dimensions of Information-Systems-Kinds of Systems
Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.3-13

UNIT 2: Basics of Computer system
A computer System-Computer Hardware Classification-Computer Software- Database Management System- Types of Database Structures or Data Models- Advances in Database Technology.
Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.91-122

UNIT 3: Telecommunications and Networks
Telecommunications-Types of Signals-communication Channel-Characteristics of Communication Channels-Communications Hardware-Communication Networks

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.150-171

UNIT 4: Decision Support Systems

Decision-Making and Decision-Support Systems**-**Decision-Making: A Concept-Simon's Model of Decision-Making-Types of Decisions-Methods for Choosing among Alternatives-Characteristics and Capabilities of DSS-Disaster Management-System Development Approaches-System Development Stages-System Development Approaches-Systems Analysis and Design Systems Analysis-Introduction-requirement Determination- Strategies for Requirement Determination- Structured Analysis Tools -Design Methods-Detailed System Design

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp. 202-217

UNIT 5: Implementation, Maintenance, Evaluation and Security of IS

System Maintenance-Evaluation of MIS-IS Security-Information System Planning- The Nolan Stage Model-The four-Stage Model of IS Planning

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp. 320-345

TEXT BOOKS:

1. Management Information systems, Managerial Perspectives, 4/e (2016), D.P. Goyal, Macmillan Publishers India Ltd.

REFERENCES:

1. Management Information systems, 10/e (2010), James A. O'Brien, George M. Marakas, McGraw-Hill Education.
2. Management Information systems, 12/e (2011), Kenneth C. Laudon, Jane P. Laundon, Prentice Hall.

WEB-REFERENCES:

1. Information Technology for Management (Global Text Project edition, c2009), by Henry C. Lucas (PDF at Global Text Project)
2. Information Systems Foundations: Constructing and Criticising (2005), ed. by Dennis N. Hart and Shirley Diane Gregor (multiple formats with commentary at ANU E Press)
3. Information Systems: A Manager's Guide to Harnessing Technology (derived from Creative Commons licensed edition published by Flat World Knowledge, ca. 2010), by John Gallaugher (PDF at saylor.org)

NATURAL DISASTER MANAGEMENT
(Open Elective - IV)

Subject Code: 16OE3042 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives

- To understand basic concepts, definitions and Terminologies used in Disaster Management.
- To Understand Types and Categories of Disasters and its Impact.
- To promote Prevention and Preparedness for disaster
- To undertake Mitigation & Risk Reduction steps
- To prioritize Rescue and Relief operation, Rehabilitation & Reconstruction

Course Outcomes

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

CO1: Application of Disaster Concepts to Management.
CO2: Ability to Categories Disasters.
CO3: Preparedness plans for disaster response.
CO4: Monitoring and evaluation plan for disaster response, Setting up of early warning systems for risk reductions

UNIT - I

Understanding Disaster: Meaning, nature, characteristics and types of Disasters, Causes and effects, Disaster-A Global View, Disaster Profile of India, The Disaster Management cycle.

UNIT – II

Natural Disasters: causes, distribution pattern,consequences and mitigation measures for Earthquake, Tsunami, Cyclone,Floods,Droughts,Landslides
Man Made Disasters: Forest Fires,Nuclear, Biological and Chemical disaster,Road Accidents

UNIT – III

Disaster Preparedness: Introduction to disaster Preparedness, Concept & Nature,Disaster Preparedness Plan,Disaster Preparedness for People and Infrastructure, Community based Disaster Preparedness Plan. Roles & Responsibilities of Different Agencies and Government

UNIT – IV

Disaster Mitigation: Meaning and concept,Disaster Mitigation Strategies,Emerging Trends in Disaster Mitigation, Mitigation management,Role of Team and Coordination

UNIT – V

Rehabilitation, Reconstruction And Recovery: Reconstruction and Rehabilitation as Means of Development,Damage Assessment,Role of various Agencies in Disaster Management and

Development, Development of Physical and Economic Infrastructure, Education and Awareness, The Philosophy of Coping with Disasters, Dealing with Victims Psychology, Role of Various Agencies in Recovery Measures,Monitoring and Evaluation of Rehabilitation Work,Constraints in Monitoring and Evaluation, Long-term Counter Disaster Planning

Text books:

1. Disaster Mitigation: Experiences And Reflections by PradeepSahni
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman - Cengage Learning

References:

1. R. B. Singh (Ed) Environmental Geography, Heritage Publishers New Delhi, 1990
2. Savinder Singh Environmental Geography, PrayagPustakBhawann 1997

SPECIAL MACHINES
(Open Elective - IV)

Subject Code: 16OE3043 **Internal marks: 30**
Credits: 2.0 **External Marks: 70**

Course Objectives:

- To develop knowledge on Principles & operation, construction, performance, maintenance, testing and performance of special motors such as BLDC motors, stepper motors and electrical motor drives.

Course Outcomes:

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

CO1: Analyze the structure of Electrical drive system of SRM motor.
CO2: Understand open loop and closed loop control of Stepper motors and also compare the open loop and closed loop systems
CO3: Evaluate torque, speed and position controller of BLDC motor drives.
CO4: Explain the basic properties of magnetic materials as applied to electric machines and applications of LIM.
CO5: Describe the operation of motor drives to meet mechanical load requirements

UNIT I: Switched Reluctance Motor

Principle of operation, Power converter for switched reluctance motor, Control of switched reluctance motor.

UNIT II: Stepper Motors

Stepper Motors Construction – Principle of operation – Theory of torque production – Hybrid stepping motor – Variable reluctance stepping motor – Open loop and closed loop control.

UNIT III: Brushless DC motor

Permanent Magnet Brushless DC Motor Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor.

UNIT IV: Linear induction motors

Construction– principle of operation– application of Linear induction drive for traction

Permanent Magnet Motors

Construction – Principle of working – Torque equation and equivalent circuits, electrically commutated DC motor.

UNIT V: Electric Motors for traction

AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K.VenkataRatnam, University press, 2009, New Delhi.
2. Special electrical machines, E.G.Janardhanan, PHI learning private limited.

Reference Books:

1. Brushless Permanent magnet and reluctance motor drives,Clarenden press,T.J.E. Miller, 1989, OxforD

INTRODUCTION TO AUTOMOBILE ENGINEERING
(Open Elective - IV)

Subject Code: 16OE3044 **Internal marks: 30**
Credits: 2 **External Marks: 70**

Course Objectives:

- To provide broad knowledge about the engine, transmission, braking system, steering, suspension and electrical subsystems of an automobile.

Course Outcomes:

On completion of this course, students will be able to

CO1: Explain construction and operation of components of engine and its lubrication system.
CO2: Explain the operation of the components involved in both carburetor based.
CO3: Explain the working of components involved in the cooling system.
CO4: Explain mechanism of starting and charging electrical systems, and electrical accessories. Discuss construction and operation of transmission system components including clutch, gearbox.
CO5:Explain construction and operation of steering, suspension and braking system components.

UNIT-I

Introduction:

Components of four wheeler automobile – Power transmission – Rear wheel drive, front wheel drive, 4 wheel drive – Types of automobile engines, Engine lubrication: Splash, Pressure lubrication systems, Oil filters, Oil pumps..

UNIT-II

Fuel System:

S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump, fuel filters – Carburetor.

C.I. Engines:

Requirements of diesel injection systems, Types of injection systems, Fuel pump, Injection timing,

UNIT-III

Cooling System:

Cooling requirements, Air cooling, Liquid cooling – Thermo, Water and Forced Circulation System

Ignition System:

Function of ignition system – Battery ignition system, Magneto coil ignition system and Electronic ignition system.

UNIT-IV

Electrical System:

Charging circuit, Generator, Current regulator, Voltage regulator – Starting system, Lighting systems, Horn, Wiper, Engine temperature indicator.

Transmission System:
Clutches, Fluid flywheel – Gear box, Types: Sliding mesh, Constant mesh, Synchro mesh and epicyclic

UNIT-V
Steering System:
Types of steering mechanism: Ackerman, Davis – Steering gears.

Suspension System:
Objects of suspension systems and Shock absorber

Braking System:
Mechanical braking system and Hydraulic brake system:

Text books:
1. Automotive Mechanics Vol-I&II, Kripal Singh, Standard Pub.
2. Automobile Engineering, William H Crouse, Donald L Anglin, McGraw Hill Pub.

References books:
1. Automotive Technology: Principles, Diagnosis, and Service, James D. Halderman, Pearson Pub.
2. Automotive Mechanics, G.B.S. Narang, Khanna Pub.
3. Automotive Mechanics, Joseph Heitner, Van Nostrand Reinhold Pub.

SIMULATION AND MODELING
(Open Elective - IV)

Subject Code: 16OE3046 **Internal marks: 30**
Credits: 2 **External Marks: 70**

Course Objectives:

- Educate students with fundamental knowledge of continuous and discrete system models and Gain some fundamental knowledge about system simulation techniques
- Gain knowledge probability theory and probability functions.
- Acquire knowledge queuing theory, discrete system simulation and different models of discrete system simulation
- Acquire knowledge about simulation programming techniques.
- Explain some elementary features of SIMSCRIPT and GPSS algorithms.

Course Outcomes:

Upon completion of this course, students shall be able to:

CO1: Differentiate continuous and discrete system models and describe system simulation techniques.
CO2: Describe the steps in continuous system simulation and list the continuous simulation methods
CO3: Analyze stochastic variables and probability functions, Outline methods for discrete simulation
CO4: Articulate queuing disciplines with mathematical solutions
CO5: Assess problems and propose solutions to SIMSCRIPT and GPSS algorithms.

UNIT-I: Introduction:

Nature of Simulation: Systems, Models and Simulation; Continuous and Discrete Systems; Components of a simulation study; Static and Dynamic physical models; Static and Dynamic Mathematical models; Advantages, Disadvantages and pitfalls of Simulation.

UNIT-II: System Simulation and Continuous System Simulation:

Types of System Simulation: analytical and Simulation methods: Comparison; Monte Carlo Method; Distributed Lag Models; Cobweb Model

UNIT –III: System Dynamics & Probability concepts in Simulation

Exponential growth and decay models; logistic curves; Generalization of growth models; System dynamics diagrams; Discrete and Continuous probability functions; Generation of Discrete distributions.

UNIT-IV: Simulation of Queuing Systems and Discrete System Simulation

Queuing Theory: Poisson Arrival patterns; Normal and Exponential distribution; Service times and Queuing disciplines

UNIT-V: Introduction to Simulation languages and Analysis of Simulation output

GPSS: Action times, Succession of events, Choice of paths; Conditional transfers and Program control statements; SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels; SIMSCRIPT statements, Estimation methods

Text books:

1. Geoffrey Gordon, "System Simulation", 2nd Edition, Prentice Hall, India, 2002.

References:

1. Jerry Banks and John S.Carson, Barry L. Nelson, David M.Nicol, "Discrete Event System Simulation", 3rd Edition, Prentice Hall, India, 2002.
2. Narsingh Deo, "System Simulation with Digital Computer, "Prentice Hall, India, 2001.
3. Thomas J. Schriber, Simulation using GPSS, John Wiley, 1991.

SOFT COMPUTING
(Open Elective – IV)

Subject Code: 16OE3047 **Internal marks: 30**
Credits: 2 **External Marks: 70**

Course Objective:

- To provide an understanding of the soft computing field
- To provide adequate knowledge about fuzzy set theory and Fuzzy Inference.
- To expose the ideas about genetic algorithm
- To provide adequate knowledge about feedback neural networks
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.

Course Outcomes:

Upon completion of the course, students should:

CO1: Demonstrate Fuzzy set theory
CO2: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
CO3: Analyze the genetic algorithms and their applications
CO4: Design single and multi-layer feed-forward neural networks
CO5: Apply neural networks to pattern classification problems

UNIT-I

Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, Membership Function Formulation and Parameterization, MF of two dimensions.

UNIT -II

Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Fuzzy Reasoning. Fuzzy Inference System Introduction, Mamdani Fuzzy Models, Sugeno Fuzzy Models.

UNIT –III

Derivative-free Optimization :Genetic Algorithms , Simulated Annealing ,Random Search

UNIT –IV

Supervised Learning Neural Networks:Perceptron ,Adaline, Back propagation Multi layer Perceptron , Radial Basis Function Networks

UNIT –V

Unsupervised Learning Neural Networks : Competitive Learning Networks ,Kohonen Self-Organizing Networks

Learning Vector Quantization, Hebbian Learning, Principal Component Analysis.

Text Book

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

References

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

Subject Code: 16HS3102 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives

- To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
- To prepare students for making presentations
- To enable students to participate in group discussions
- To prepare students for facing interviews confidently

Course Outcome

At the end of the course, the students will be able to

CO1: state meanings, synonyms, antonyms, analogies, idioms, phrases, one word substitutes, word roots, prefixes and suffixes for words in general.
CO2: present and interpret data on select topics using pre-existing slides.
CO3: contribute proactively and extrapolate in group discussions.
CO4: prepare Résumé / CV and face interview.
CO5: develop communication skills by playing different roles.

Course Syllabus

Unit I: Vocabulary Extension for facing competitive examinations
Unit II: Paper, PowerPoint and Video Presentations
Unit III: Group Discussion
Unit IV: Job Application and Résumé / CV Writing—Interview Preparation
Unit V: Speaking: Role-play

Course Material:

Textbook

Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.

Reference Books

1. Rani, K. Nirupa et al. *Speak Well*. Orient Blackswan: Hyderabad, 2012.
2. Prasad, M. Hari et al. *Strengthen Your Steps*. Maruthi: Hyderabad, 2010.
3. Prasad, M. Hari et al. *Strengthen Your Communication Skills*. Maruthi: Hyd, 2014.
4. Ashraf, M. Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2005.

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DIGITAL SIGNAL PROCESSING LAB

Subject Code: 16EC3112 **Internal Marks: 25**
Credits: 2 **External Marks: 50**

Course Objectives

- To support the teaching of basic concepts in digital signal processing using computer simulations and appropriate hardware.
- 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
- To find Discrete Fourier Transform of a sequence.
- To implement FIR/IIR filters on DSP Processors.

Course Outcomes

CO1: Student will be able to write MATLAB programs for various signal processing techniques.
CO2: Student will be able to Design FIR (LP/HP) filters with Windowing Techniques.
CO3: Student will be able to Design IIR (LP/HP) filters with Chebyshev and Butterworth filtering techniques.
CO4: Student will be able to Calculate Discrete Fourier Transform
CO5: Student will be able to write programs on DSP Processor using CC Studio.

List of Experiments:

PART – A
Write a MATLAB program

1. To generate standard signals in continuous time and discrete time domain.

2. To generate sum of sinusoidal signals having frequencies 300Hz, and 1 KHz.

3. To verify Linear and Circular Convolution.

4. To find frequency response of analog LP/HP filters.

5. To find the Discrete Fourier transform and inverse Discrete Fourier Transform of the given sequence and also find power spectral density.

6. To design FIR (LP/HP) filter using windowing techniques.

a. Using Rectangular Window

b. Using Triangular Window

c. Using Kaiser Window.

7. To design IIR (LP/HP) filter using Chebyshev and Butterworth filtering techniques.

8. To find FFT of given 1-D signal and plot magnitude and phase spectrums.

PART – B

1. To study the architecture of DSP Chips – TMS320C 5X/6X instructions.
2. To implement FIR (LP/HP) filter on DSP Processor using CC Studio.
3. To implement IIR (LP/HP) filter on DSP Processor using CC Studio.

PART – C

Write a SIMULINK program

1. To design FIR (LP/HP) filter using windowing techniques.
   a. Using Bartlett Window
   b. Using Hamming Window
   c. Using Blackman Window.
2. To design IIR (LP/HP) filter using Chebyshev Typr – I, Type – II and Butterworth filtering techniques.

ADDITIONAL EXPERIMENTS:

Write a MATLAB program

1. To find magnitude and shifted magnitude spectrum of a given image.
2. To find edges in an image using different edge operators.
3. To find low-pass and high-pass filtered images of a given image.
4. To find DWT (Discrete Wavelet Transform) of a given image.

MICROPROCESSORS AND MICROCONTROLLERS LAB

SubjectCode: 16EC3113 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

Course Objectives

- Learning the MASAM (MACRO ASSEMBLER) software.
- Learning Addressing modes of 8086.
- Understand the Assembly language programming.
- Learning the instruction set of 8086 microprocessor and 8051 microcontroller.
- Study the interfacing of the processor with various peripheral devices

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 string instructions.
CO3: Write assembly language programs using Branch instructions.
CO4: Analyze and apply the working of 8255, 8279, 8259, 8251 ICs and design and develop the programs.
CO5: Interface 8051 ports with various peripherals and develop programs

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.

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. 8255 – PPI : Write ALP to generate square wave using PPI.

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Subject Code: 16HS3202 **Internal Marks: Nil**
Credits: Nil **External Marks: Nil**

Course objective:

- To study the basics of intellectual property law.
- To acquire knowledge on copy right law and other formalities related to it.
- To explore knowledge on patent law and cyber law.
- To become familiar about trade mark law.
- To provide knowledge on different aspects of trade secrets.

Course outcomes:

CO1: Able to study basics of intellectual Property Law.
CO2: Able to describe copy right law and other formalities.
CO3: Able to analyze patent and cyber law.
CO4: Able to explain trade mark law.
CO5: Able to summarize different aspects of trade secrets.

UNIT I

Basics of Intellectual Property Law: Introduction to Intellectual Property Law; Evolutionary past; Intellectual Property Law Basics; Types of Intellectual Property; Innovations and Inventions of Trade related Intellectual Property Rights; Agencies Responsible for Intellectual Property Registration; Infringements; Over use or Misuse of Intellectual Property Rights; and Compliance and Liability Issues.

UNIT II

Copyright Law and Infringements: Introduction to Copyrights; Principles of Copyright; Subject Matters of Copyright; Rights Afforded by Copyright Law; Copyright Ownership; Transfer and Duration; Right to Prepare Derivative Works; Rights of Distribution; Rights of performers; Copyright Formalities and Registration; Limitations; Infringement of Copyright; International Copyright Law; and Semiconductor Chip Protection Act.

UNIT III

Fundamentals of Patent and Cyber Law: Introduction to Patent Law; Rights and Limitations; Rights under Patent Law; Patent Requirements; Ownership and Transfer; Patent Application Process and Granting of Patent; Patent Infringement and Litigation; International Patent Law; Double Patenting; Patent Searching; Patent Cooperation Treaty; and New developments in Patent Law.

Introduction to Cyber Law; Information Technology Act; and Cyber Crime and E-commerce.

UNIT IV

Trade Mark Law: Introduction to Trade Mark; Trade Mark Registration Process; Post registration procedures; Trade Mark maintenance; Transfer of rights; Inter parties Proceedings; Infringement; Dilution of Ownership of Trade Mark; Likelihood of confusion; Trade Mark claims; Trade Marks Litigation; and International Trade Mark Law.

UNIT V

Principles of Trade Secrets: Introduction to Trade Secrets; Maintaining Trade Secret; Physical Security; Employee Access Limitation; Confidentiality Agreement; Trade Secret Law; Unfair Competition; Trade Secret Litigation; Breach of Contract; and Application of State Law.

TEXT BOOKS:

1. Deborah E. Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications

REFERENCE BOOKS:

1. Prabhuddha Ganguli: ‘Intellectual Property Rights” Tata Mc-Graw –Hill, New Delhi
2. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: "Intellectual PropertyRights", Excel Books. New Delhi.
4. P Narayanan, Intellectual Property Law, Eastern Law House; Third Edition (2013)