ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS
(Choice Based Credit System)

R16

Electronics and Communication Engineering

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for batches admitted from 2016-2017)

SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.

SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

Department of Electronics and Communication Engineering

College VISION:

To provide the society with Centre of Learning in Technical Education and Research that motivates the students to evolve into dynamic professionals.

College MISSION

- Providing Quality education, student centered teaching learning process and sate of the art infrastructure for professional aspirants hailing from both rural and urban areas.
- Evolving this organization into a centre of Academic and Research Excellence.
- Imparting Technical Education that encourages independent thinking develops strong domain knowledge and positive attitudes towards holistic growth of young minds.

Department VISION:

To impart quality technical education for Electronics and Communication Engineering Professionals by enriching technical knowledge to cater the needs of industry and society.

Department MISSION:

M1: To facilitate the graduates in acquiring technical exposure to create innovative ideas through state of the art curriculum and conducive learning environment.

M2: To provide individual attention and build the character through quality technical education.

M3: To improve the professional skills of the rural students to fulfill the present industry and society requirements.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Graduates shall have fundamental and advanced knowledge in Electronics and Communication Engineering in order to get employed in various organizations and to pursue higher studies.

PEO2: Graduates shall have ability in analyzing, designing and creating innovative solutions and projects for solving engineering and societal problems.

PEO3: Graduates shall have organizing capability, presentation skills and ethical practice.

PEO4: Graduates shall have skills for continued independent, lifelong learning to become experts in their profession.

PROGRAM OUTCOMES

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.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO 1: Student skills enhancement in electronic circuits by using components and modern simulation tools.

PSO 2: To enhance the standard of ECE graduate by developing modern safe and secure communication methods.

1. INTRODUCTION

Academic Program of the institute are governed by rules and regulations approved by the Academic Council, which is the highest Academic body of the Institute. These academic rules and regulations are applicable to the students admitted during the academic year 2016-17 into first year of four year undergraduate program offered by the college leading to Bachelor of Technology (B.Tech) degree in the respective discipline.

2. ADMISSIONS

2.1 Admission into first year of any Four Year B. Tech Program of study in Engineering: Admissions into first year of B.Tech Program of Swarnandhra College of Engineering & Technology (**Subsequently referred to as SCET**) will be as per the norms stipulated by Jawaharlal Nehru Technological University Kakinada& Govt. of Andhra Pradesh. Admissions in each program in the Institution are classified into **CATEGORY – A,** through convener, EAMCET and **CATEGORY- B** filled by the college management.

2.2 Admission into the Second year (Lateral Entry) of any Four year B. Tech Program of study in Engineering: The candidates should have passed the qualifying exam. (B.Sc. graduation & Diploma holders) for admission into the 3rdsemester directly, based on the rank secured by the candidate at Engineering Common Entrance Test [ECET for (FDH)] in accordance with the instructions received from the Convener, ECET and Government of Andhra Pradesh.The candidate has to satisfy the other eligibility requirements stipulated by theJNT University Kakinada and / or the Government of Andhra Pradesh from time to time.

2.3 Admissions with advance standing: These may arise in the following cases:

a) When a student seeks transfer from other colleges to SCET and desirous to pursue the study at SCET in an eligible branch of study.
b) When students of SCET get transferred from one regulation to another regulation or from previous syllabus to revised syllabus.
c) When a student after long discontinuity rejoins the college to complete his/her Program of study for the award of degree.
d) When a student is not able to pursue his/her existing Programme of study but wishes to get transferred to another Program of study.

These admissions may be permitted by the Academic Council of SCET as per the norms stipulated by the statutory bodies and Govt. of Andhra Pradesh. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Program of study at SCET will be governed by the transitory regulations.

3. PROGRAMMES OFFERED (UNDER GRADUATE)

Presently, the college is offering Under Graduate Programs in the following disciplines:

- Computer Science and Engineering (CSE)
- Electronics and communication Engineering (ECE)
- Electrical and Electronics Engineering (EEE)
- Information Technology (IT)
- Mechanical Engineering (ME)
- Civil Engineering(CE)

3.1 Structure of the Program:

Preamble:

It is emphasized in UGC Guidelines on Choice Based Credit System (CBCS), that the important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. It is also suggested to adopt grading system in place of conventional system of marks and percentages.

The proposed CBCS for Swarnandhra College of Engineering and Technology provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides advantageous approach in which the students can register courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach through open electives.

Key words CBCS, such as Course, credit, credit point, CGPA, SGPA, Grade Point, Letter Grades, Foundation Courses (FC), Program Core Course (PCC) and Elective Courses (EC)as given in UGC guidelines are used in this proposal with the same definitions.

Each Program of a Discipline or branch of study will consist of:

i). Foundation courses in Basic Sciences, Engineering Sciences and Humanities.

ii). Program core courses to impart broad based knowledge needed in the concerned branch of study.

iii). Elective courses from the discipline or interdisciplinary areas /industry related opted by the student based on his/her interest in specialization.

Each Program of study will be designed to have 35-40 theory courses and 20-25 laboratory courses. The distribution and types of courses offered from the above is indicated in the following table.

Foundation Courses – Basic Sciences & Humanities
Foundation Courses – Engineering Sciences
Program Core Courses in the branch of study
Elective Courses

Note: All components prescribed in the curriculum of any Program of study will be conducted and evaluated.

Contact hours: Depending on the complexity and volume of the course the number of contact hours per week will be determined.

Credits:

- One teaching hour of theory/tutorial class is equivalent to one credit.
- Two hours of Practical class is equivalent to one credit.
- Each theory or elective course will be (L-T-P-C) equal to 4-0-0-4 or 3-1-0-4 or 3-0-2-4 or 2-0-4-4 or 1-0-4-3.Further, the laboratory courses can be (L-T-P-C) equal to 0-0-2-1 or 0-0-4-2.

3.2 Curriculum for each Program of study:

- The Four year curriculum of any B. Tech Program of study in any branch of Engineering is formulated based on the guidelines mentioned in 3.1 and will be recommended by the concerned Board of Studies and is approved by the Academic council of the college.
- In case of students admitted under lateral entry, the respective regular curriculum contents from 3rd semester onwards are to be pursued by them.
- In case of students admitted under advanced standing, the equivalence will be prepared by the concerned Board of Studies and the Academic Council has to approve the same.
- After approval from the Academic Council, the detailed curriculum will be prepared and made available to all the students along with the academic regulations.

3.3 Maximum duration of study and cancellation of admission:

- Maximum duration permitted for any student to successfully complete the four year B. Tech. Program of study will be:
- Eight academic years in sequence from the year of admission for a normal student admitted into first year of any Program.
- Six academic years in sequence from the year of admission for a Lateral entry student admitted into second year of any Program.
- For students admitted with advanced standing, the maximum time for completion of Programof study,will be twice the period in terms of academic years in sequence,

stipulated in the Program curriculum defined at the time of admission.

- In case, any student fails to meet the above applicable/eligibleconditions for the award of degree, his/her admission stands cancelled.

4. **DURATION OF THE PROGRAMME AND MEDIUM OF INSTRUCTION:** The duration of theB. Tech. Program is four academic years consisting of eight semesters. The medium of instruction and examinations are in English. Students, who fail to fulfill all the academic requirements for the award of the degree within the prescribed duration as per article 3.3,will forfeit he/sheadmission in B.Tech course**.**
5. **MINIMUM INSTRUCTION DAYS:** Each semester will consist of 22 weeks duration with minimum of110 working days which includes instruction, Midsemester examinations and Final examinations.
6. **TRANSITORY REGULATIONS:**

   For students admitted under advance standing, these transitory regulations will provide the modus of operandi.At the time of such admission, based on the Program pursued (case by case)

   - Equivalent courses completed by the student are established by the BOS of concerned discipline.
   - Marks/Credits are transferred for all such equivalent courses and treated as successfully completed in the Program of study prescribed by SCET.
   - A Program chart of residual courses not completed will be derived and a Program of study with duration specified will be prescribed for pursuit at SCET.
   - Marks obtained in the previous system,as the case maybe, shall be converted to equivalentgrades and CGPA..

   All other modalities and regulations governing shall be the same as those applicable to the stream of students with whom; such a candidate is merged with current regulations.
7. **DISTRIBUTION AND WEIGHTAGE OF MARKS:**

   (i) In each semester the course of study consists of 5/6 theory subjects + 3 Laboratories. However, in the 8thsemesterthere will be only 2 theory subjects in addition to the major project work.

   (ii) The performance of a student in each semester will be evaluated subject wise with a maximum of 100 marks for both Theory and Laboratories, where asSeminar, Soft Skills and Aptitude Lab and Mini Project/Internship at the end of respective semesters are evaluated internally for 50 marks each. The Main Project during 8thSemis evaluated for 200 marks.

(iii) **Seminar:** The seminar is internal evaluation. For the Seminar, the student shall collect the information on a specialized topic (thrust areas) and prepare a report showing his understanding over the topic and submit to the department, which shall be evaluated by the Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

(iv) **Soft Skills and Aptitude Lab;** This lab is internal evaluation. This has two components, Soft Skills and Aptitude. Each will be evaluated separately for 50 marks in a semester and the average of two components shall be taken as the final score. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

(v) **Mini Project/Internship:** This Mini Project/ Internship is internal evaluation. The mini project/Internship shall be carried out during the summer break for a minimum of 4 weeks after the 6th semester and to be completed before the start of the 7th Semester. A report has to be submitted at the beginning of the 7th semester for assessment by an internal evaluation committee comprising Head of the Department and two faculty of the department including the project Supervisor for 50 Marks. A minimum of 50% maximum marks shall be obtained to earn the corresponding credits.

(vi) For each theory subject the distribution will be 40 marks for internal evaluation and 60 marks for the end semester examination. The internal evaluation of 40 marks consists of descriptive test for 30 marks and assignment for 10 marks.

(vii) As part of internal assessment for each theory subject there will be 2 cycles of examinations. Each cycle consists of descriptive test for 30 marks and assignment for 10 marks which will be conducted for three units of syllabus. **Weighted average of two cycle's** performance will be considered for award of internal assessment. A weightage of 80% for the best cycle performance and 20% for second best cycle performance are given for internal evaluation.

(viii) The **descriptive** examination question paper consists of three questions (at least one question from each unit) and all are need to be answered in 90 minutes.

(ix) The **end semester** examination will be conducted for 60 marks covering total syllabus of the concerned subjects. In end examination pattern, **Part – A** consists of a compulsory questions from all units (Brainstorming/Thought provoking/Case study) for 12 marks. **Part – B** has **6 questions** (one question from each unit) of which **four questions** to be answered and valued for 48 marks.

(x) End practical examination will be conducted for 60 marks by the teacher concerned and

external examiner. For practical subjects there will be a continuous assessment during the semester for 40 internal marks with 20 marks for day-to-day work, including record valuation and 20 marks for internal test.

(xi) For the subjects of design or drawing such as Engineering Drawing, etc., the distribution will be 40 marks for internal evaluation with 20 marks for day-to-day work, and 20 marks from two internal test (80% of first best + 20% of second best). End examination will be conducted for 60 marks.

(xii) **Main Project:** The project work carried out by the students during 8th semester is evaluated for internal assessment and external examination.

a) Internal Assessment: Internal Assessment will be carried out by Projects internal assessment committee consisting of 1) Head of the Department 2) Supervisor and 3) Senior faculty member appointed by the Principal.

b) External Examination: External Examination will be conducted by Project external examination committee consisting of 1) Head of the Department 2) Supervisor and 3) External member selected from the panel of examiners.

Total marks to be awarded for Project work is 200, of which 60 marks will be for Internal Evaluation and 140 marks for External examination through presentation / viva - voice by the student. The internal evaluation will be on the basis of two seminars on the topic of the project.

(xiii) **Mandatory Courses**: Non-Credit Courses: Courses: These courses are mandatory for students and students have to successfully complete these courses.

a. IPR and Ethics in 5th Semester
b. Certificate Course in 6th Semester (MOOCs or Professional Certificate)

The evaluation shall be totally internal and students should get satisfactory result to get B. Tech degree. Students should produce valid certificate for certificate course to get satisfactory result.

(xiv) **Skill Based Lab (Elective):** This shall be conducted in 7thsemester on thrust areas of respective departments. Students shall register and put up a minimum of 75% attendance. Based on their performance, examination to be conducted like other Labs.

(xv) **Open Electives:** Students are to choose one Open Elective (OE – I) during 6th Semester and one Open Elective (OE – II) in 8th Semester from the list of Open Electives given in the Course Structure. The student has to choose one Open Elective subject in Sem VI and Sem VIII from the list other than offered by parent Department, which was not studied in earlier semesters.

8. **GAP YEAR CONCEPT:** Outstanding students who wish to pursue entrepreneurship full time can take break of one year, after the 4th Semester with prior approval from the Principal (as per the recommendations of the Central Committee). This may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation.

9. **ATTENDANCE REGULATIONS AND CONDONATION:**

(i) A student will be eligible to appear for end semester examinations, if he/she acquired a minimum of 75% of attendance in aggregate of all the subjects.

(ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (Above 65% and below 75%) in any semester may be granted by the College Academic Committee.

(iii) Prescribed Condonation fee shall be payable by the student to appear for the end examination.

(iv) A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered consecutively by the Department.

(v) Shortage of Attendance below 65% in aggregate in no case be condoned

(vi) Students with less than 65% of attendance in any semester are not eligible to take up their end examination of that particular semester and their registration for examination shall be cancelled.

(vii) Attendance may also be condoned for those who participate in Intercollegiate/university sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose (>65%) and recommended by the concerned authority. He/She shall pay the prescribed condonation fee.

(viii) A student will be condoned only four times for regular student and three times for lateral entry students during entire course of study.

10. **MINIMUM ACADEMIC REQUIREMENTS:**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in **S.No.9.**

(i) A student will be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical design or drawing subject or project if he/she secures not less than a minimum of 35% of marks exclusively in the end semester examinations in each of the subjects,for which the candidate had appeared. However, the candidate should have secured a minimum of 40% marks in both external and internal components put together to declare eligible for pass in the subject.

(ii) A student will be promoted from first semester to second semester, second semester to third and third to fourth semester, if he/she satisfies the minimum attendance requirement.

(iii) A student will be promoted from 4th Semester to 5th Semester, if he/she fulfills the academic requirements of 40% of the credits up to 4thSemester from all the examinations (Regular and supplementary) whether or not the candidate takes the examinations.

(iv) A student will be promoted from 6th to 7th Semester, only if he/she fulfills the academic requirements of 40% of the credits up to 6th Semester from, all the examinations (regular and supply) whether or not the candidate takes the examinations.

(v) There will be supplementary examinations along with the regular semester examinations enabling the students to give a fair chance to appear in the subject if any failed.

(vi) Candidate who fails in 8th Semester can appear for Advanced Supplementary Examinations soon after the announcement of result.

11. ELIGIBILITY FOR AWARD OF DEGREE:

A student shall be eligible for award of the B.Tech. Degree if he/she fulfills all the following conditions:

(i) Pursued a course of study for a stipulated period of four years and not more than eight years.

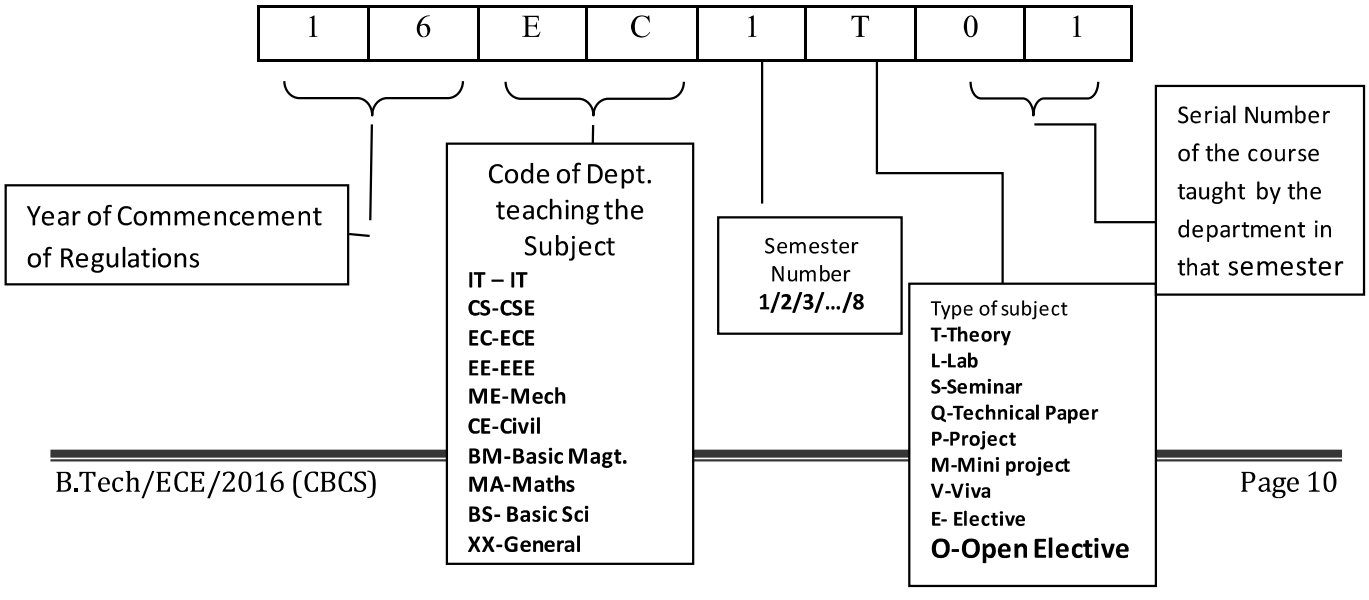
(ii) Registered and successfully completed all the components prescribed in the program of study to which he/she is admitted.

(iii) Obtained CGPA greater than or equal to 5 (minimum requirements for pass).

(iv) Has no dues to the institute, hostels, libraries, NCC/NSS etc., and No disciplinary action is pending against him/her

12. COURSE CODE & COURSE NUMBERING SCHEME:

The subject codes will be given by the department teaching the subject. Each subject code contains 8 characters. The 8 characters for each subject will be filled as per the following guidelines.



13. GRADING SYSTEM:

13.1 Award of Grade:

(i) Grade Point Average (GPA):

a) The Grade Point Average (GPA) will be calculated according to the formula.

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the subject i

G_i = grade points obtained by the student in the subject.

b) To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time.

$$CGPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the subject i

G_i = grade points obtained by the student in the subject.

(ii) After a student satisfies the requirements prescribed for the award of UG/PG Program he/she shall be placed in one of the following four grades. The award of the degree is based on CGPA on a grade point scale of 10.

CGPA	Award of Division
≥7.50*	First Class with Distinction
≥6.50	First Division
≥5.50	Second Division
≥5.00	Pass Division
<5.00	Unsatisfactory

* In addition to the required CGPA of 7.50, the student must have necessarily passed all the courses of every semester in the minimum stipulated period for the programme.

13.2 Award of Grade in Each Semester:

(i) Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each subject. The letter grades and the corresponding grade points are as given in the Table.

Percentage of Marks Scored	Letter Grade	Grade points
>=90	S	10
80 - 89	A	9
70-79	B	8
60-69	C	7
50-59	D	6
40-49	E	5
<40	F	Fail

(ii) A student earns a minimum of 5 grade points (E grade) in a subject is declared to have successfully completed the subject, and is deemed to have earned the credits assigned to that subject. However it should be noted that a pass in any subject/term paper/seminar/project/miniproject shall be governed by the rules mentioned in S.No.7.

(iii) Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his/her performance in all courses taken in that semester and also indicating the grades.

(iv) Transcripts: After successful completion of the total programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued up to any point of study to any student on request and by paying the stipulated fee in force.

(v) The Academic Council has to approve and recommend to the JNTUK, Kakinada for the award of a degree to any student.

14. SUPPLEMENTARY EXAMINATIONS: In addition to the Regular Final Examinations held at the end of each semester, Supplementary Final Examinations will be conducted during the academic year. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period cannot be relaxed under any circumstance.

15. ADVANCED SUPPLEMENTARY EXAMINATIONS: Candidate who fails the subjects in 8th Semester can appear for Advanced Supplementary Examinations.

16. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):

(i) The students have to acquire 132 credits from 3rdSemester to 8thSemester of B. Tech Program (regular) for the award of the degree.

(ii) Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

(iii) The same attendance regulations are to be adopted as per the rules mentioned in item No.9.

(iv) **Rules for Promotion in to Next Higher Class:** (6th Semester to 7thSemester): A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to 6th Semester.

17. CONDUCT AND DISCIPLINE:

Students admitted in SCET (Autonomous) are to be followed the conduct and discipline of the college and which will be framed from time to time.

18. MALPRACTICES: The Principal shall refer the cases of malpractices in internal assessment tests and Semester-End Examinations, to a Malpractice Enquiry Committee, constituted by him/her for the purpose. The principal shall take necessary action, against such cases based on the recommendations of the committeeas per stipulated norms.

19. GENERAL:

a) Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her","hers".

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

c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of The Principal is final and which is to be ratified by the Chairman of the Governing Body.

d) 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.

LIST OF OPEN ELECTIVES

S.No.	Course Code	Name of the Course	Offering Dept.
1	16CEXO01	Green Buildings and Infrastructure	CIVIL
2	16CEXO02	Disaster Management	
3	16EEXO01	Electrical Safety Management	EEE
4	16EEXO02	Non-Conventional Energy Sources	
5	16MEXO01	Composite Materials	MECH
6	16MEXO02	Introduction to Operation Research	
7	16ECXO01	Introduction to Nanotechnology and its Applications	ECE
8	16ECXO02	Introduction to Global Positioning and Navigation Satellite Systems	
9	16CSXO01	Introduction to Data Base Management Systems	CSE
10	16CSXO02	Introduction to Big Data Analytics	
11	16ITXO01	Introduction to Software Project Management	IT
12	16ITXO02	Introduction to Internet of Things (IoT)	
13	16BMXO01	Innovations and Entrepreneurship	MBA
14	16BMXO02	Industrial Sociology & Psychology	

Note: The student has to choose one Open Elective subject in Sem VI and Sem VIII from the above list other than offered by parent Department, which was not studied in earlier semesters.

ELECTRONICS AND COMMUNICATION ENGINEERING

R16 COURSE STRUCTURE – UG (CBCS)

SEMESTER-I

S.No	Course Code	Course Name	L	T	P	C	I	E	TM
1	16BS1T01	Proficiency Course in English – I	3		-	3	40	60	100
2	16MA1T01	Differential Equations and Laplace Transforms	3	-	-	3	40	60	100
3	16MA1T02	Numerical Methods and Integral Transforms	3	-	-	3	40	60	100
4	16BS1T02	Engineering Chemistry	3	-	-	3	40	60	100
5	16CS1T01	Fundamentals of Computers and C-Programming	3	-	-	3	40	60	100
6	16ME1T01	Engineering Drawing	1	-	4	3	40	60	100
7	16BS1L01	English Proficiency Lab	-	-	4	2	40	60	100
8	16BS1L02	Engineering Chemistry Lab	-	-	4	2	40	60	100
9	16CS1L01	C-Programming Lab	-	-	4	2	40	60	100
		Total	16		16	24	360	540	900

SEMESTER-II

S.No	Course Code	Course Name	L	T	P	C	I	E	TM
1	16BS2T01	Proficiency Course in English – II	3		-	3	40	60	100
2	16MA2T01	Linear Algebra and Vector Calculus	3	-	-	3	40	60	100
3	16EE2T01	Electrical Networks	3	-	-	3	40	60	100
4	16BS2T03	Engineering Physics	3	-	-	3	40	60	100
5	16CS2T01	OOPS Through C++	3	-	-	3	40	60	100
6	16BS2T04	Environmental Science	3	-	-	3	40	60	100
7	16BS2L01	English Communication Skills Lab	-	-	4	2	40	60	100
8	16BS2L03	Engineering Physics Lab	-	-	4	2	40	60	100
9	16CS2L01	OOPS Through C++ Lab	-	-	4	2	40	60	100
		Total	18	-	12	24	360	540	900

ELECTRONICS AND COMMUNICATION ENGINEERING

R16 COURSE STRUCTURE – UG (CBCS)

SEMESTER-III

S.No	Course Code	Course Name	L	T	P	C	I	E	TM
1	16MA3T02	Complex Variables and Random Variables	3	1	-	4	40	60	100
2	16EC3T01	Signals and Systems	3	1	-	4	40	60	100
3	16EE3T04	Electrical Engineering	3	-	-	3	40	60	100
4	16EC3T02	Electronic Devices and Circuits	3	-	-	3	40	60	100
5	16EC3T03	Digital Electronics	3	-	-	3	40	60	100
6	16EC3L01	Electronic Devices and Circuits Lab	-	-	4	2	40	60	100
7	16EE3L02	Electrical Engineering Lab	-	-	4	2	40	60	100
8	16EC3L02	Digital Electronics Lab	-	-	4	2	40	60	100
		Total	15	2	12	23	320	480	800

SEMESTER-IV

S.No	Course Code	Course Name	L	T	P	C	I	E	TM
1	16EC4T01	Electronic Circuit Analysis	3	1	-	4	40	60	100
2	16EE4T02	Control Systems	3	1	-	4	40	60	100
3	16EC4T02	Pulse and Digital Circuits	3	-	-	3	40	60	100
4	16EC4T03	Principles of Analog Communications	3		-	3	40	60	100
5	16BM4T01	Principles of Economics and Management	3		-	3	40	60	100
6	16EC4L01	Electronic Circuit Analysis Lab	-	-	4	2	40	60	100
7	16EC4L02	Pulse and Digital Circuits Lab	-	-	4	2	40	60	100
8	16EC4L03	Analog Communications Lab	-	-	4	2	40	60	100
		Total	15	2	12	23	320	480	800

ELECTRONICS AND COMMUNICATION ENGINEERING

R16 COURSE STRUCTURE – UG (CBCS)

SEMESTER – V

S. No	Course Code	Course Name	L	T	P	C	I	E	TM
1	16EC5T01	Electromagnetic Waves and Transmission Lines	3	1	-	4	40	60	100
2	16EC5T02	Electronics Measurements and Instrumentation	3	1	-	4	40	60	100
3	16EC5T03	Digital Communications	3	-	-	3	40	60	100
4	16EC5T04	Linear and Digital IC Applications	3	-	-	3	40	60	100
5		Elective - I	3	-	-	3	40	60	100
6	16EC5L01	Digital Communications Lab	-	-	4	2	40	60	100
7	16EC5L02	Linear and Digital IC Applications Lab	-	-	4	2	40	60	100
8	16EC5S01	Seminar	-	-	4	2	50	-	50
9	-	Mandatory Course (Professional Ethics and IPR)					-	-	-
		Total	15	2	12	23	330	420	750

SEMESTER – VI

S.No	Course Code	Course Name	L	T	P	C	I	E	TM
1	16EC6T01	Antennas and Wave Propagation	3	1	-	4	40	60	100
2	16EC6T02	Microprocessors and Microcontrollers	3	1	-	4	40	60	100
3	16EC6T03	VLSI System Design	3	-	-	3	40	60	100
4		Elective –II	3	-	-	3	40	60	100
5		Open Elective –I	3		-	3	40	60	100
6	16EC6L01	Microprocessors and Microcontrollers Lab	-	-	4	2	40	60	100
7	16EC6L02	VLSI Design Lab	-	-	4	2	40	60	100
8	16BS6T01	Soft Skills and Aptitude Lab	-	-	4	2	50	-	50
9	-	Mandatory course - Certificate Course (MOOC's, Professional Certificate)					-	-	-
		Total	15	2	12	23	330	420	750

ELECTRONICS AND COMMUNICATION ENGINEERING

R16 COURSE STRUCTURE – UG (CBCS)

SEMESTER – VII

S.No	Course Code	Course Name	L	T	P	C	I	E	TM
1	16EC7T01	Microwave and Optical Communications	3	1	-	4	40	60	100
2	16EC7T02	Digital Signal Processing	3	1	-	4	40	60	100
3	16EC7T03	Radar Engineering	3		-	3	40	60	100
4		Elective – III	3		-	3	40	60	100
5	16EC7L01	Microwave & Optical Communications Lab	-	-	4	2	40	60	100
6	16EC7L02	Digital Signal Processing Lab	-	-	4	2	40	60	100
7		Skill Based Laboratory Elective	-	-	4	2	40	60	100
	16EC7LE1	1. Advanced Communication Engineering Lab							
	16EC7LE2	2. Robotics Lab							
	16CS7LE5	3. JAVA Programming Lab							
	16EC7LE3	4. Radio and Television Lab							
8	16EC7M01	Internship/ Mini Project (This work carried out during summer break after 6th Sem)	-	-	-	2	50	-	50
		Total	12	2	12	22	330	420	750

SEMESTER – VIII

S.No	Course Code	Course Name	L	T	P	C	I	E	TM
1		Elective –IV	3	-	-	3	40	60	100
2		Open Elective – II	3	-	-	3	40	60	100
3	16EC8P01	Project Work	-	-	24	12	60	140	200
		Total	6	-	24	18	140	260	400

ELECTIVE – I

S. No.	Course Code	Subject Title
1	16CS5E06	Operating Systems
2	16CS5E05	Computer Organization and Architecture
3	16EC5E01	Telecommunication Switching Systems
4	16EC5E02	Digital System Design Using Verilog

ELECTIVE – II

S. No.	Course Code	Subject Title
1	16EC6E01	Analog and Digital IC Design
2	16CS6E05	Data Structures
3	16EC6E02	Satellite Communications
4	16EC6E03	Television Engineering

ELECTIVE – III

S. No.	Course Code	Subject Title
1	16EC7E01	Mixed Signal Design
2	16CS7E05	OOPS Through Java
3	16EC7E02	Cellular and Mobile Communications
4	16EC7E03	Embedded System

ELECTIVE – IV

S. No.	Course Code	Subject Title
1	16EC8E01	System on Chip
2	16CS8E05	Software Engineering
3	16EC8E02	EMI/EMC
4	16EC8E03	Digital Image Processing

B. TECH SEMESTER-I	L	T	P	C
	3	-	-	3
16BS1T01: Proficiency Course in English -I				

COURSEOUTCOMES

A) Reading Skills.

Addressing explicit and implicit meaning of a text. Understanding the context.

Learning new words and phrases.

Using words and phrases in different contexts.

B) Writing Skills:

Using the basic structure of a sentence.

Applying relevant writing formats to create paragraphs, essays, letters, e-mails, reports and presentations.

Retaining a logical flow while writing.

Planning and executing an assignment creatively.

C) Interactive skills:

Analyzing a topic of discussion and relating to it.
Participating in discussions and influencing them.
Communicating ideas effectively.

Presenting ideas coherently within a stipulated time.

D) Grammar in context

Enable the skills of grammar using in a situation

Identifying the needs of apt grammar in life related situation
Promoting discourse with grammar effectively

Syllabus:

S No	Content	Hours
UNIT –I	The Power of Prayer One word substitutes Nouns – Pronouns	8
UNIT -II	Is progress real? Commonly Confused words Verbs	8
UNIT-III	Secret of Work Collocations Adjectives ,Adverbs and Articles	8
UNIT-IV	An Astrologer's Day GRE words Prepositions and Sentences	8
UNIT-IV	Marriage Proposal Idioms Conjunctions and Interjections	8
UNIT-VI	The Road not Taken Phrasal Verbs Tenses	8
		48

Text Book: Proficiency Course in English, Semester –I by Maruti Publications.

SEMESTER-I	L	T	P	C
	3	-	-	3
16MA1T01: DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS				

COURSE OUTCOMES

The students are able to

1. Apply knowledge of differential equations in physical phenomena
2. Solve the differential equations using Laplace transforms.
3. Find the power series expansion of functions about given point.
4. Solve first order partial differential equations.

SYLLABUS:

UNIT –I

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE:

Linear – Bernoulli – Exact - Reducible to exact - Newton's Law of cooling-Law of natural growth and Decay - Orthogonal Trajectories.

UNIT -II

LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER:

Non-homogeneous equations of higher order with constant coefficients 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 for solving second order linear differential equations.

UNIT –III

PARTIAL DERIVATIVES:

Taylor series and Maclaurin's series expansions of functions of single and two variables (without Proofs) - Jacobian, Functional dependence.

UNIT –IV

PARTIAL DIFFERENTIAL EQUATIONS:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations, Solutions of Linear Partial differential equations with constant coefficients by the method of separation of Variables.

UNIT –V

LAPLACE TRANSFORMS:

Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function.

UNIT –VI

INVERSE LAPLACE TRANSFORMS:

Inverse Laplace transforms -Convolution theorem (without proof).

Application: Solutions of ordinary differential equations using Laplace transforms.

TEXT BOOKS:

1. **B.S. GREWAL**, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.
2. **B.V. RAMANA**, Higher Engineering Mathematics, Tata McGraw Hill.

REFERENCES:

1. **ERWIN KREYSZIG**, Advanced Engineering Mathematics, 9th Edition, Wiley-India

SEMESTER-I	L	T	P	C
	3	-	-	3
16MA1T02: Numerical Methods and Integral Transforms				

COURSE OUTCOMES

Students are able to

1. Solve the algebraic and transcendental equations by different methods and also know the different interpolation formulae to find a polynomial or the value of the polynomial at a given point.
2. Find the quadrature, the solutions of ordinary differential equations by different formulae.
3. Solve problems on Z-transforms and Fourier transforms.
4. Express a function as a Fourier series.

Syllabus

UNIT-I

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Introduction - Bisection Method - Method of False Position - Iteration Method - Newton Raphson Method.

UNIT-II

INTERPOLATION:

Introduction - Finite differences - Forward Differences Backward differences - Central differences - Symbolic relations, Differences of a polynomial - Newton's formulae for interpolation - Lagrange's Interpolation formula for unevenly spaced points.

UNIT-III

NUMERICAL INTEGRATION AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

Numerical Integration: Trapezoidal rule - Simpson's 1/3 rule - Simpson's 3/8 rule. Numerical Solution of Ordinary Differential Equations: Solution by Taylor's series method - Euler's Method - Euler's Modified Method - IV order Runge Kutta Method

UNIT-IV

Z-TRANSFORM:

Introduction - properties - Damping rule - Shifting rule - Initial and final value theorems - Inverse z transform- -Convolution theorem. **Applications:** Solution of difference equations by Z-transforms.

UNIT–V

FOURIER SERIES:

Introduction- Determination of Fourier coefficients - even and odd functions - change of interval - Half-range sine and cosine series

UNIT – VI

FOURIER TRANSFORMS:

Fourier integral theorem (statement only) - Fourier Transforms, Fourier sine and cosine transforms - properties - inverse transforms - Finite Fourier transforms.

TEXT BOOKS:

1. **B.S. GREWAL**, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.
2. **B.V. RAMANA**, Higher Engineering Mathematics, Tata McGraw Hill.

REFERENCES:

1. S. S. Sastri (PHI), Introductory Methods of Numerical Analysis 5th Edition.
2. ERWIN KREYSZIG, Advanced Engineering Mathematics, 9th Edition, Wiley-India

SEMESTER-I	L	T	P	C
	3	-	-	3
16BS1T02: ENGINEERING CHEMISTRY				

COURSE OUTCOMES

After Completion of the course students are able

1. Estimate the Ions present in the water.
2. Explain the concept of Electro Chemistry.
3. Discuss the mechanism of Corrosion in Metals.
4. Explain the advantages of Fuels, Polymers and Advanced materials in day to day life.

Syllabus

UNIT- I

WATER TECHNOLOGY:

Hard Water – Estimation of Hardness By EDTA Method – Potable Water- Sterilization and Disinfection – Boiler Feed Water – Boiler Troubles – Priming And Foaming , Scale Formation, Boiler Corrosion, Caustic Embrittlement – Softening of Water - By Lime Soda, Zeolite Processes – Ion Exchange Process – Desalination Process by - Reverse Osmosis – Electro Dialysis.

UNIT- II

ELECTRO CHEMISTRY:

Electro Potential –Determination of single electrode potential – Standard electrode potential - Nernst Equation (problems)–Electro Chemical cell (Galvanic Cell) **-Reference Electrodes-** Standard Hydrogen Electrode, Calomel Electrode Determination of pH and conductivity – Applications (Strong Acid Vs Strong Base) - **Batteries** – Primary Cell: Dry Cell – Secondary Cell: Lead Acid Accumulator, Lithium Ion Battery – **Fuel Cells** – Hydrogen – Oxygen Fuel Cell, Methanol – Oxygen Fuel Cell.

UNIT- III

CORROSION:

Introduction - **Theories of Corrosion**(i) Dry Corrosion (Pilling Bed worth rule) (ii) Wet Corrosion – Galvanic Series – **Types of Corrosion**: Galvanic Corrosion, Differential Aeration Corrosion, Pitting Corrosion, Stress Corrosion – Factors Influencing Corrosion – Nature of The Metal , Nature of The Environment – **Corrosion Control**: Material Selection & Design – Cathodic Protection- Surface Coatings – Methods of Applications on Metals -Hot Dipping , Electroplating, Electroless Plating – Paints – Their Constituents & Their Function.

UNIT-IV

FUELS:

Introduction to Fuels – Classification – **Solid Fuels** Merits & Demerits - Calorific Value – HCV and LCV – Bomb Calorimeter - Problems Based on Calorific Values – Analysis of Coal (Proximate and Ultimate Analysis) – Numerical Problems Based on Analysis – **Liquid Fuels** Merits & Demerits – Petroleum – Refining – Cracking(types) –Petrol – Diesel Knocking – Octane Number, Cetane Number - **Gaseous Fuels** Merits & Demerits – Natural Gas – LPG, CNG.

UNIT-V

POLYMERS SCIENCES & TECHNOLOGY:

POLYMERS- introduction – Types of Polymers – Mechanism of Polymerization (Addition and Condensation) – Determination of Molecular weight by weight and number average methods - Individual Polymers (Preparation Properties and uses of PS, PVC and Bakelite) – Biodegradable polymers – Ziegler Natta Catalysis.

PLASTICS – Types – Compounding of Plastics – Moulding (Four Types) - Bullet Proof Plastics – Engineering Applications.

RUBBER &ELASTOMERS: Introduction –Preparation – Vulcanization – Compounding of Rubber – Preparation, Properties Uses of Buna-S, Buna-N and Thiokol-Engineering Applications.

UNIT- VI

ENGINEERING MATERIALS, GREEN AND NANO CHEMISTRY :

Refractories (Types, Properties Applications) – **Cement-**Hardening and Setting-Deteriorations of cement concrete – **Solar Energy Materials** – Introduction - Advantages and Disadvantages – Construction and Working of Photovoltaic cell – Solar Reflectors - **Carbon Nano tubes** - Preparation (Arc discharge, Laser Ablation, Chemical Vapor Deposition (CVD) methods), Properties & Applications – **Green Chemistry** – Principles -Engineering Applications.

TEXT BOOKS:

1. N. Y. S. Murthy, V. Anuradha, K RamanaRao" A Text Book of Engineering Chemistry", Matuthi.
2. K. SeshaMaheswaramma and Mridulachugh (2013) A Text Book of Engineering Chemistry, Pearson Publications.

REFERENCES:

1. ShashiChawal "A Text Book of Engineering Chemistry, DhanpatRai Publishing company Ltd.
2. S. S. Dara (2013) Text Book of Engineering Chemistry, S. Chand Technical Series.

SEMESTER-I	L	T	P	C
	3	-	-	3
16CS1T01: FUNDAMENTALS OF COMPUTERS AND C PROGRAMMING				

COURSE OUTCOMES

The student will be proficient in the following:

1) Know the fundamentals of computers, Algorithm, Flowchart and basics of C.
2) Use different Control Structures, Arrays, Strings and define functions with parameter passing techniques.
3) Use pointers, dynamic memory management functions and command line arguments.
4) Use different derived data types such as structures, unions, enum and typedef and Access data through files.

Syllabus

UNIT-I

COMPUTER FUNDAMENTALS:

Computer System: definition, block diagram ,**Hardware:** components, mother board layout, block diagram of mother board, **Software:** definition, types of software, **Algorithm:** definition, properties of algorithm, algorithms on basic problems, **Flowchart:** definition, symbols used in flow charts, flow charts for basic problems, types of computer Languages, bits, bytes, binary system.

UNIT-II

FUNDAMENTALS OF C LANGUAGE:

Character Set, Tokens, Identifiers, Constants, Basic Data Types and Sizes, Arithmetic Operators, Relational Operators, Logical Operators, Conditional Operator, Increment and Decrement Operators, Assignment Operators, Bit-wise Operators, Special Operators, Expressions, Operator Precedence and Order of Evaluation, Evaluation of Expressions, Type Conversions: Implicit and Explicit, Structure of C Program.

UNIT-III

CONTROL STRUCTURES:

Selection Statements: Simple if, if-else Statement, Nested if Statement, else-if Ladder, switch Statement. **Iterative Statements**: while, do-while and for loops, break and continue statements, goto statement.

ARRAYS

Array definition, declaration, initialization and accessing array elements of 1-D and2-D arrays.

STRINGS

String definition, declaration, initialization and accessing, string handling functions in **string.h**

UNIT-IV

FUNCTIONS:

Introduction to Function, Types of Functions, Return Statement, Declaration, Definition and Calling a Function, Parameter Passing Techniques, Storage Classes, Passing 1-D Array to Functions.

Recursion: Types of recursion, rules of recursion, recursive solutions for factorial of a number, Fibonacci Series and GCD of two numbers.

C Preprocessors: File Inclusion and Macro Substitution.

UNIT-V

POINTERS:

Pointer Definition, Declaration, Initialization and Accessing a Pointer, void pointer, null pointer, Pointer Arithmetic, Pointer to Pointer, Dynamic Memory Management Functions.

STRUCTURES AND UNIONS

Definition, Declaration and Initialization of Structures, Accessing Structures, Nested structures, Array of Structures, Pointer to structures

Definition, Declaration and Initialization of Unions, difference between structures and unions

UNIT-VI

FILES: Introduction to Files, File I/O functions, File opening modes, sequential and random accessing files, file operations.

TEXT BOOKS

1.	Programming in ANSI C	E. Balagurusamy	TMH

REFERENCES:

1.	Programming with ANSI and Turbo C	Ashok N. Kamthane	Pearson
2.	Let us C	YashwantKanetkar	BPB
3.	The C Programming Language	Kernighan & Ritchie	PHI
4.	Programming in C	PradipDey&ManasGhosh	Oxford

SEMESTER-I	L	T	P	C
	1	-	4	3
16MEIT01: ENGINEERING DRAWING				

COURSE OUTCOMES

1. Usage of drawing instruments and construct polygons.
2. Understand the orthographic projections of points, lines and planes in different positions.
3. Understand the orthographic projections of Solids.
4. Convert the Orthographic projections into Isometric and vice versa.

UNIT – I

INTRODUCTION:

Engineering Drawing and Plane Curves, Use of Drawing Instruments and Conventions.

GEOMETRICAL CONSTRUCTIONS: Constructions of Polygons using General Method.

CONICS: Construction of Ellipse, Parabola and Hyperbola by Eccentricity Method.

CYCLOIDAL CURVES: Construction of Cycloid, Epi-Cycloid and Hypo-Cycloid.

UNIT - II

PROJECTIONS OF POINTS AND LINES:

Introduction to Orthographic Projections - Projection of Points.

PROJECTION OF STRAIGHT LINES: Parallel to both the Planes, Parallel to One Plane and Inclined to Other Plane, Inclined to Both the Planes.

UNIT – III

PROJECTIONS OF PLANES:

Introduction to Perpendicular Planes, Perpendicular to both the Reference Planes, Perpendicular to One Plane and Parallel to Other Plane, Perpendicular to One Plane and Inclined to Other Plane, Inclined to Both the Reference Planes.

UNIT – IV

PROJECTIONS OF SOLIDS:

Projections of Simple Solids like Prism, Cylinder, Pyramids and Cones. Projections of Solids with Axis Perpendicular to one Plane, Projections of Solids with Axis Parallel to Both the Planes.

UNIT – V

PROJECTIONS OF SOLIDS – AXIS INCLINED TO ONE PLANE:

Projections of Solids with Axis inclined to one plane and parallel to other Plane (Axis inclined to the VP and Parallel to the HP, Axis Inclined to the HP and Parallel to the VP).

UNIT – VI

ISOMETRIC PROJECTIONS:

Principles of Isometric Projections - Isometric Scale, Isometric Projections of Planes, Simple Solids, Conversion of Isometric to Orthographic Views and Vice Versa.

TEXT BOOKS:

1. Engineering Drawing by N.D. Bhatt, Charotar Publishers.
2. Engineering Drawing by K.L. Narayana & P. Khannaiah., SCIETECH Publishers.

REFERENCES:

1. Engineering Drawing by M.B. Shah & B.C. Rana., Pearson's Publishers.
2. Engineering Drawing by K. Venugopal., NEW AGE Publications.

SEMESTER-I	L	T	P	C
	-	-	4	2
16BS1L01: ENGLISH PROFICIENCY LAB				

COURSE OUTCOMES

a) READING SKILLS.

Addressing explicit and implicit meaning of a text.

Understanding the context.

Learning new words and phrases.

Using words and phrases in different contexts.

b) WRITING SKILLS:

Using the basic structure of a sentence.

Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.

Retaining a logical flow while writing.

Planning and executing an assignment creatively.

c) INTERACTIVE SKILLS:

Analyzing a topic of discussion and relating to it.

Participating in discussions and influencing them.

Communicating ideas effectively.

Presenting ideas coherently within a stipulated time.

d) LIFE SKILLS AND CORE SKILLS:

Examining self-attributes and identifying areas that require improvement self diagnosis, self-motivation.

Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.

Understanding the importance of helping others-community service, enthusiasm.

WEEK	TOPIC	
1	UNIT- 1 Section-A	Introduction to syllabus Greeting, Introducing and taking leave
2	UNIT- 1 Section-B	Pure Vowels
3	UNIT- II Section-A	Giving Information and Asking for information
4	UNIT- II Section-B	Diphthongs
5	UNIT- III Section-A	Inviting, Accepting and Declining Invitations
6	UNIT- III Section-B	Consonants
7	UNIT- IV Section-A	Commands, Instructions and Requests
8	UNIT- IV Section-B	Accent and Rhythm
9	UNIT- V Section-A	Suggestions and Opinions
10	UNIT- V Section-B	Intonation
10WEEKS	TOTAL	

TEXT BOOKS:

Strengthen Your Communication Skills: Part – A by Maruthi Publications.

REFERENCES:

1) INFOTECH English (Maruthi Publications)
2) Personality Development and Soft Skills (Oxford University Press, New Delhi)

SEMESTER-I	L	T	P	C
	-	-	4	2
16BS1L02: ENGINEERING CHEMISTRY LAB				

COURSE OUTCOMES

1. Estimate the Total hardness, DO and pH present in the Water.
2. Analyze the Potentiometric and Conductometric titrations.
3. Estimate the HCl, KMnO4, Ferric Iron present in the solution.
4. Identify the Acid number and Saponification Value of Oils.

List of Experiments

S. No	TITLE
	Introduction to chemistry lab
1	Estimation of HCl using standard Na2CO3
2	Determination of Total hardness of water
3	Estimation of Ferric iron
4	Estimation of KMnO4 using standard H2C2O4
5	Estimation of Dissolved Oxygen by Wrinkles Method
6	Determination of pH by pH – Meter and universal indicator Method
7	Conductometric titration of Strong acid Vs Weak base
8	Conductometric titration of strong acid **Vs** Strong base
9	Potentiometric titration of Strong acid Vs Strong base
10	Potentiometric titration of Strong acid Vs Weak base
11	Preparation of Phenol-Formaldehyde Resin
12	Determination of saponification value of oils
13	Determination of Pour and Cloud point of oils

TEXT BOOKS:

1. Engineering Chemistry Lab Manual Prepared by Chemistry Faculty.

REFERENCES:

1. Dr. JyotsnaCherukuis (2012) Laboratory Manual of Engineering Chemistry-II, VGS Techno Series.
2. K. Mukkanti (2009) Practical Engineering Chemistry, B. S. Publication.

SEMESTER-I	L	T	P	C
	-	-	4	2
16CS1L01: C PROGRAMMING LAB				

COURSE OUTCOMES

After Completion of the course student are

1. Write programs using different control structures, arrays and strings.
2. Develop user defined functions with parameter passing techniques.
3. Implement programs using structures, unions, typedef, enum and pointers.
4. Implement programs with sequential access and random access file processing.

EXERCISE-I

1) Identify different components of a computer system. Write about them.

2) Prepare block diagram of mother board of a PC and describe each component.

3) Prepare algorithm for sequence and selection control structures.

4) Prepare algorithm for iterative control structure

5) Draw flowcharts for control structures (sequence, selection & iterative).

EXERCISE-II

1) Demonstrate the structure of C program

2) Write a C program to find the size of basic data types in C language.

3) Write a C program to find the biggest of three numbers using ternary operator.

4) Write a C program to convert decimal number to binary number using bitwise operators.

EXERCISE-III

1) Write a C program to find the biggest of three numbers using nested if-else statement.

2) Write a C Program to find the roots of a quadratic equation.

3) Write a C program to perform arithmetic operations using switch statement.

4) Write a C program to calculate the electricity bill using else-if ladder statement.

5) Write a C program to find the sum of elements of an integer array.

EXERCISE-IV

1) Write a C program to find the smallest and largest elements of an integer array.

2) Write a C program to perform matrix addition by checking compatibility.

3) Write a C program to perform matrix multiplication by checking compatibility.

4) Write a C program to generate the prime numbers up to n.

EXERCISE-IV

1) Write a C program to find given number is Armstrong number or not
2) Write a C program to find the length of the string without using string functions.
3) Write a C program to check the given string is palindrome or not without using string functions.
4) Write a C program to perform string operations using string handling functions.

EXERCISE-VI

1) Write a C program to find the square of a number using function and macro.
2) Write a C program to demonstrate the use of static storage class.
3) Write a C program to pass array to function and count the sum of elements in the array.

EXERCISE-VII

1) Write C functions to generate Fibonacci series with and without using recursion.
2) Write C functions to factorial with and without using recursion.
3) Write C functions to GCD of two numbers with and without using recursion.

EXERCISE-VIII

1) Write a C program to find address of a variable and a pointer variable.
2) rite a C functions to swap two numbers using call by value and call by reference
3) Write a C program to print employee details using structures and array of structures.

EXERCISE-IX

1) Write a C program to read and write individual characters to a file.
2) Write a C program to copy contents of one file to another.
3) Write a C program to reverse the contents in a file.
4) Write a C program to merge two files into third file.

SEMESTER-II	L	T	P	C
	3	-	-	3
16BS2T01: PROFICIENCY COURSE IN ENGLISH -II				

CORUSEOUTCOMES

a) READING SKILLS.

Addressing explicit and implicit meaning of a text.

Understanding the context.

Learning new words and phrases.

Using words and phrases in different contexts.

b) WRITING SKILLS:

Using the basic structure of a sentence.

Applying relevant writing formats to create paragraphs, essays, letters, e-mails, reports and presentations.

Retaining a logical flow while writing.

Planning and executing an assignment creatively.

c) INTERACTIVE SKILLS:

Analyzing a topic of discussion and relating to it.

Participating in discussions and influencing them.

Communicating ideas effectively.

Presenting ideas coherently within a stipulated time.

d) GRAMMAR IN CONTEXT

Enable the skills of grammar using in a situation

Identifying the needs of apt grammar in life related situation

Promoting discourse with grammar effectively

SYLLABUS:

S No	Content	Hours
UNIT –I	Inspiring speech One word substitutes Subject- verb agreement Describing objects	8
UNIT -II	Dial 000 Commonly confused words Voice Paragraph writing	8
UNIT-III	My Struggle for Education Collocations Reported speech Letter writing	8
UNIT-IV	A Snake in the grass GRE words Conditional clauses Note making and note taking	8
UNIT-V	Lithuania Idioms Degrees of comparison Resume	8
UNIT-VI	Virtue Phrasal verbs Simple compound and complex sentences Report writing	8
	Total	48

Text Book: Proficiency Course in English -II by Maruti Publications.

SEMESTER-II	L	T	P	C
	3	-	-	3
16MA2T01: LINEAR ALGEBRA AND VECTOR CALCULUS				

COURSE OUTCOMES

The students are able to

1. Apply the knowledge of matrices for solving linear system of equations
2. Find the powers of the matrices by using Cayley Hamilton theorem.
3. Apply the knowledge of evaluate improper integrals by using Beta and Gamma functions.
4. Apply the knowledge of Vector Differentiation and Vector Integration in finding work done by a force.

Syllabus:

UNIT I

LINEAR SYSTEMS OF EQUATIONS:

Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- Gauss Elimination, Jacobi and Gauss Seidel Method.

UNIT II

EIGEN VALUES - EIGEN VECTORS:

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

UNIT III

SPECIAL FUNCTIONS:

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

UNIT IV

MULTIPLE INTEGRALS:

Multiple integrals - Double and triple integrals - Change of variables - Change of order of Integration. Application: Applications of Integration to Lengths, Volumes and Surface areas of solids of revolution in Cartesian Coordinates.

UNIT V

VECTOR DIFFERENTIATION:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

UNIT VI

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.

Application: Work done by a force

TEXT BOOKS:

1. **B.S. GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
2. **B.V. RAMANA,** Higher Engineering Mathematics, Tata McGraw Hill

REFERENCES:

1. ERWIN KREYSZIG, Advanced engineering Mathematics, 9th Edition, Wiley-India

SEMESTER-II	L	T	P	C
	3	-	-	3
16EE2T01: ELECTRICAL NETWORKS				

COURSE OUTCOMES

At the end of course the students are able to solve

1. Various electrical networks in presence of active and passive elements.
2. Electrical networks with network topology concepts.
3. Electrical networks by using principles of network theorems with DC and AC excitation
4. Any R, L, C network with sinusoidal excitation and any R, L, C network with variation of any one of the parameters i.e R, L, C. and f. and Any magnetic circuit with various dot conventions.

UNIT-I

FUNDAMENTAL OF ELECTRICAL CIRCUITS:

Active and passive components and their V-I relations. Sources (dependent and independent) - source transformation technique –Ohm's and Kirchhoff's laws- Network reduction techniques (series, parallel and series – parallel combination of R, Land C separately) - Star-to-delta and delta-to-star transformation, nodal analysis and mesh analysis.

UNIT-II

NETWORK TOPOLOGY:

Definitions of Graph and Tree. Basic cutset and tieset matrices for planar networks. Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources. Duality and Dual networks.

UNIT-III

THEOREMS WITH DC EXCITATION:

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT-IV

SINGLE PHASE A.C SYSTEMS:

Periodic waveforms (determination of AC fundamentals). Concept of phase angle and phase difference, addition and subtraction of phasors. Complex and polar forms of representations, steady state analysis of R, L and C circuits, series and parallel circuits. Power Factor and its significance – Real, Reactive power and apparent Power.

UNIT-V

THEOREMS WITH AC EXCITATION:

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT-VI

RESONANCE:

Locus diagrams for various combination of R, L and C. Resonance, concept of band width and Quality factor.

MAGNETIC CIRCUIT:

Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits. Faraday's laws of electromagnetic induction Concept of self and mutual inductance. Dot convention-coefficient of coupling and composite magnetic circuit. Analysis of series and parallel magnetic circuits.

TEXT BOOKS:

1. Engineering circuit analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company, 6th edition.
2. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd.

REFERENCES:

1. Networks Analysis by A. Sudhakar, ShyammohanS.Pillai, The McGraw-Hill Companies
2. Introduction to circuit analysis and design by TildonGlisson, Jr, Springer Publications
3. Circuits by A.Bruce Carlson , Cengage Learning Publications
4. Network Theory Analysis and Synthesis by SmarajitGhosh, PHI publications

B. TECH SEMESTER-II	L	T	P	C
	3	-	-	3
16BS2T03: ENGINEERING PHYSICS				

COURSE OUTCOMES

Student able to understand:

1. Describe optical properties of solids, basic crystal systems and determination of crystal structures.
2. Apply Schrodinger wave equation and explain the concept of free electron theory, band theory.
3. Explain the Magnetic, Dielectric and Superconducting materials properties.
4. Differentiate pure and doped semiconducting materials for better utility.

Syllabus

UNIT-I

CRYSTALLOGRAPHY AND X-RAY DIFFRACTION:

Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC-Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law-Bragg's Spectrometer.

UNIT-II

MAGNETIC AND DIELECTRIC PROPERTIES

MAGNETIC PROPERTIES: Origin of magnetic moment-Magnetic Materials: Classification of Magnetic Materials and properties - Hysteresis Loop of ferromagnetic material.

DIELECTRIC PROPERTIES: Introduction - Electronic, ionic and orientational (Qualitative) polarizations - Internal fields in solids – Clausius - Mossotti equation.

UNIT-III

ELECTROMAGNETISM:

Introduction-Concept of Electric Flux - Gauss's Law – Integral and Differential forms - Magnetic Field –The Biot-Savart's Law - Ampere's Law - B for a Solenoid - Faraday's Law of induction - Lenz's law - Displacement Current - Maxwell's Equations.

UNIT –IV

QUANTUM MECHANICS AND BAND THEORY OF SOLIDS:

De Broglie concept of matter waves, Schrodinger Time Independent wave equation – Application to a Particle in a box- Defects of Classical free electron theory of metals – Quantum free electron theory – concept of Fermi energy - Bloch theorem (qualitative) – Kronig – Penney model –

Origin of energy band formation in solids – Classification of materials into conductors, semiconductors & insulators.

UNIT – V

SEMICONDUCTOR PHYSICS

Introduction – Intrinsic semiconductor and carrier concentration – Equation for conductivity – Extrinsic semiconductor and carrier concentration – Drift and diffusion currents – Einstein's equations - Hall Effect and its applications.

UNIT-VI

LASERS AND SUPER CONDUCTIVITY:

LASERS: Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

SUPERCONDUCTIVITY: General properties – BCS Theory of Superconductivity - Meissner effect – Type-I and Type-II superconductors – Flux quantization –Josephson effects – Applications of Superconductors.

TEXT BOOKS

1 A text book of Engineering Physics by M-N- Avadhanulu & P.G. Kshirasagar (S-Chand publications)

2 Engineering Physics by R.K. Gaur and S.L. Gupta.

REFERENCES:

1 Engineering Physics" by Palanisamy (Scitech Publishers)

2 Engineering Physics by Mani Naidu S (Pearson Publications)

3 Introduction to solid state physics" by Charles Kittle (Willey India Pvt-Ltd)

4 Applied Physics" by T.Bhimasenkaram (BSP BH Publications)

5 Applied Physics" by M. Arumugam (Anuradha Agencies)

6 Physics by David Halliday and Robert Resnick – Part I and Part II

SEMESTER-II	L	T	P	C
	3	-	-	3
16CS2T01: OBJECT ORIENTED PROGRAMMING THROUGH C++				

COURSE OUTCOMES

The student will be proficient in the following:

1. Gain the basic knowledge on Object Oriented concepts and stream classes.
2. Declare classes and create objects and describe how to access private, public and protected members of a class.
3. Implement constructor, destructor functions, overloading operators and use inheritance to build class hierarchies.
4. Implement programs with sequential access and random access file processing and handling exceptions.

Syllabus

UNIT I

INTRODUCTION:

The Object Oriented Technology, Disadvantages of Conventional Programming, Advantages of OOP. Structure of a C++ Program, Differences between C and C++, Header Files and Libraries.

INPUT AND OUTPUT IN C++

Streams, Stream Classes Hierarchy, Bit Fields, Manipulators.

UNIT II

Tokens in C++, Variable Declaration and Initialization, Data Types, Constants, L Value and R Values, Operators in C and C++, Scope Access Operator, Comma Operator, This Operator, Reference Variable, Decision and Loop Statements.

FUNCTIONS IN C++

Structure of a Function, Passing Arguments, Return by Reference, Default Arguments, Const Arguments, Inputting Default Arguments, Inline Functions, Function Overloading, Recursion.

UNIT III

CLASSES AND OBJECTS:

Class Definition, Declaring Objects, Access Specifiers and their scope, Member functions, Outside member functions as inline, Data Hiding or Encapsulation, Memory for Class and Objects, Static Member variables, Static Member Functions, Static Object, Array of Objects, Objects as Function Arguments, Friend Functions, Friend class, Local class, Empty Class, Qualifiers and Nested Classes, Member Function and Non-Member Function.

UNIT IV

CONSTRUCTORS AND DESTRUCTORS:

Introduction of Constructor, Characteristics, Applications, Parameterized Constructors, Overloading Constructors, Constructor with Default Arguments, Copy Constructor and Destructors.

OPERATOR OVERLOADING:

Introduction of Overloading, Overloading Unary Operators, Constraint on Increment and Decrement Operators, Overloading Binary Operators, Overloading with Friend Functions, Overloading Assignment Operator, Rules for Overloading Operators.

UNIT V

INHERITANCE:

Introduction of Inheritance, Access Specifiers, Protected Data with Private Inheritance, Types of Inheritances, Virtual Base Class, Constructors and Destructors in Inheritance, Constructor and Destructor in Derived Class, Advantages and Disadvantages of Inheritance.

POLYMORPHISM

Polymorphism, Types, Pointer and Inheritance, Virtual and Pure Virtual Functions, Abstract Classes.

UNIT VI

APPLICATIONS WITH FILES:

File Stream Classes, File Opening Modes, File Pointers and Manipulators, Sequential Access Files, Binary and ASCII Files, Random Access Files.

EXCEPTION HANDLING

Principles of Exception Handling, Keywords, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions.

TEXT BOOK:

1. Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

References:

1.Object Oriented Programming C++, Joyce Farrell, Cengage.

2.Mastering C++, Venugopal, Raj Kumar, Ravi Kumar TMH.

3.Object Oriented Programming with C++, 2nd Ed, SouravSahay, and OXFORD.

SEMESTER-II	L	T	P	C
	3	-	-	3
16BS2T04: ENVIRONMENTAL SCIENCE				

COURSE OUTCOMES

After completion of the course student able to

1. Describe the individual conservation methods and equitable use of resources towards the sustainable development.
2. Estimate the current rapid loss, reasons and impacts of biodiversity.
3. Identify the equipment's using with their technology and find out efficient solution methods to eliminate the pollutants from the environment.
4. Explain the necessity of seeking international cooperation in environmental planning, and prevention of environmental problems.

Syllabus:

UNIT – I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE:

Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion.

UNIT - II

NATURAL RESOURCES:

Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III

ECOSYSTEM AND ITS CONSERVATION:

Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-IV

BIODIVERSITY AND ITS MANAGEMENT:

Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India– Conservation of biodiversity: conservation of biodiversity.

UNIT –V

ENVIRONMENTAL POLLUTION:

Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.

Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

UNIT - VI

Social Issues: Population growth and explosion, effects. Water conservation, rain water harvesting. Role of information Technology in Environment and human health. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act – Motor Vehicle Act - Issues involved in enforcement of environmental legislation.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Field work: visit to an industrial area/ecosystem area (Forest, Grassland, Desert, and Aquatic)

TEXT BOOKS:

1. Environmental Studies by K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. A text book of Environmental Studies by C. P. Kaushik & AnubhaKaushik, New Age International Publishers.

REFERENCES:

1. Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2. A text book of Environmental Studies by ShaashiChawla, TMH, New Delhi.

SEMESTER-II	L	T	P	C
	-	-	4	2
16BS2L01: ENGLISH COMMUNICATION SKILLS LAB				

COURSE OUTCOMES

1. Make use of proper body language and use appropriate dialogues in various situations.
2. Take part in presentations.
3. Apply skills in interviews and telephonic interviews.
4. Compare and Contrast his/her ideas in a debate and Take part in group discussions

Syllabus and Lesson Plan

No. of Sessions	Name of the Topic
2	Unit - 6 Body Language
2	Unit - 7 Dialogues
2	Unit - 8 Presentation Skills
2	Unit - 9 Group Discussion
2	Unit - 10 Interviews and Telephonic interviews.
2	Unit - 11 Debates
12	**Total**

TEXT BOOK:

1. Strengthen Your Communication Skills – Maruthi Publications.

REFERENCES:

1. Effective technical communication – Ashraf Rizvi.
2. A course in English communication – MadhaviApte.

SEMESTER-II	L	T	P	C
	-	-	4	2
16BS2L03: ENGINEERING PHYSICS LAB				

COURSE OUTCOMES

1. Verify some of the physical properties of light and verify the laws of stretched strings.
2. Calculate physical properties of the given materials.
3. Calculate some of the properties of semiconducting materials.
4. Verify some of the properties of ray optics .

List of Experiments

Any Ten Experiments of the Following

A. MECHANICS:

1. Determination of the Rigidity Modulus of given material wire using Torsional Pendulum.
2. Determination of the Acceleration due to Gravity and Radius of Gyration using Compound Pendulum.
3. Determination the Frequency of vibration in Transverse and Longitudinal Modes using Melde's Apparatus.
4. Determination Frequency of A.C supply by using Sonometer

B. OPTICS:

5. Determination of wavelength of Laser using diffraction grating.
6. Determination of Numerical Aperture of an Optical Fiber.
7. Determination of the Planck's constant using Photo-Cell.

C. ELECTRO-MAGNETISM AND ELECTRONICS:

8. Study the variation of Magnetic Field along the axis of a solenoid coil using Stewart-Gee'sApparatus.
9. Determination of the Time Constant for a C-R Circuit.
10. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
11. Study of Characteristic curves (I/V) of a Zenerdiode to determine its Breakdown voltage.
12. Determination of Thermoelectric coefficient of a Thermistor by using its Characteristic curve.

REFERENCES:

1. Engineering Physics Lab Manual Prepared by Physics Faculty.

SEMESTER-II	L	T	P	C
	-	-	4	2
16CS2L01: OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB				

COURSE OUTCOMES

After Completion of the course student are:

1. Implement functions using parameter passing techniques. Implement classes and create objects to access private public and protected member of a class.
2. Implement constructor and destructor functions and overloading operators with and without friend function.
3. Implement programs using inheritance to build class hierarchies.
4. Implement programs with sequential access and random access file processing and handling exceptions.

EXERCISE-1

1) Write a CPP Program to demonstrate the structure of a C++ program.
2) Write a CPP Program to display the names of header files, definitions and list of functions supported.
3) Write a program to show the base of a numeric value of a variable using **Hex, Oct** and **Dec** manipulator functions.
4) Write a CPP Program to use of the standard manipulators normally used in the stream classes.
5) Write a CPP Program to demonstrate the usage of bit fields.

EXERCISE-2

1) Write a CPP Program to define constant pointer and pointer to constant and perform possible operations.
2) Write a CPP Program access a variable in different scopes by using scope resolution operator and the use of comma operator.
3) Write a CPP Program to swap two numbers using call by value, call by address, call by reference and return by reference.
4) Write a CPP Program to calculate square and cube of a number using inline functions and macros. (Demonstrate the use of inline functions compared to macros).
5) Write a CPP Program to find the area of a rectangle, a triangle and surface area of a sphere using function overloading.

EXERCISE-3

1) Write a CPP Program to declare all members of a class as public, Access the members using objects. (Use public, protected, private).
2) Write a CPP Program to access the member functions inside and outside a class.
3) Write a CPP Program to access private data using non-member functions. (Use friend function).
4) Write a CPP Program to pass objects to functions by pass by value method.
5) Write a CPP Program to declare main () function as member function and overload it.

EXERCISE-4

1) Write a CPP Program to show that "for each object constructors is called separately" and read the values through keyboard (Use Constructor).
2) Write a CPP Program to create constructor with arguments and pass the arguments to constructor.
3) Write a CPP Program to create object and release them using destructor.
4) Write a CPP Program to perform addition, subtraction, multiplication of two objects using operator keyword.
5) Write a CPP Program to overload unary and binary operator overloading with friend function.

EXERCISE-5

1) Write a CPP Program to derive a class publicly from base class. Declare base class members under public, private and protected.
2) Write a CPP Program to derive single and multiple inheritances.
3) Write a CPP Program to declare virtual base class. Derive a class using two virtual classes.
4) Write a CPP Program to implementation of Virtual Function.
5) Write a CPP Program to Implementation of Pure Virtual Function.

EXERCISE-6

1) Write a CPP Program to write and read text in a file. Use ofstream and ifstreamclasses.
2) Write a CPP Program to open a file for writing and reading purpose. Use open () function.
3) Write a CPP Program write text in a file. Read the text from the file from EOF. Display the contents in reverse order.
4) Write a CPP Program to demonstrate that the data is read from file using ASCII format.
5) Write a CPP Program to find the factorial of a number. Throw multiple exceptions and define multiple catch statements to handle exceptions.

SEMESTER-III	L	T	P	C
	3	1	-	4
16MA3T02: COMPLEX VARIABLES AND RANDOM VARIABLES				

COURSE OUTCOMES

students are able to

1. Illustrate the knowledge of matrices for solving linear system of equations.
2. Describe the powers of the matrices by using Cayley Hamilton theorem.
3. Apply the knowledge to evaluate improper integrals by using Beta and Gamma functions.
4. Explain about the knowledge of vector differentiation and vector Integration in finding work done by a force.

UNIT-I

FUNCTIONS OF A COMPLEX VARIABLE:

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

UNIT-II

COMPLEX INTEGRATION:

Line integral – evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (Only statements) and related problems.

UNIT-III

COMPLEX POWER SERIES:

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. (Only statements) and related problems. Singular point – isolated singular point – pole of order m – essential singularity

UNIT-IV

RESIDUE:

Evaluation of residue– Residue theorem (Statement only) and related problems.

UNIT-V

THE RANDOM VARIABLE:

The Random Variable Concept: Definition of a Random Variable – Conditions for a Function to Be a Random Variable - Discrete and Continuous Random Variables – Mixed Random Variables – Distribution Function – Density Function: Existence – Properties of Density Functions – Gaussian Random Variable – Other Distribution and Density Examples: Binomial – Poisson – Uniform - Exponential distributions.

UNIT-VI

OPERATION ON ONE RANDOM VARIABLE – EXPECTATION:

Expectation: Expected value of a random variable – Expected Value of a Function of a Random Variable – Conditional Expected Value – Moments: Moments about the origin - Central Moments - Variance and skew – Chebychev's inequality – Markov's Inequality - Functions that Give Moments: Characteristic function – Moment generating function.

TEXT BOOKS:

1. A text book of Engineering Mathematics, B.V. Ramana, Tata McGraw Hill.
2. Probability, Random variables & Random Signal Principles – Peytoon Z peebles, TMH, 4th Edition 2001.

REFERENCES:

1. Complex variables & Statistical Methods , S.Chand publications
2. Probability & Statistics by K. Murugesan, P. Gurusamy, Anuradha Publications.

SEMESTER-III	L	T	P	C
	3	1	-	4
16EC3T01: SIGNALS AND SYSTEMS				

COURSE OUTCOMES

students are able to:

1. Describe the signal fundamentals in terms of types and how to represent the various signals.
2. Explain the concept of Fourier series and Fourier transforms to determine the signal and system characteristics.
3. Demonstrate concepts of sampling theorem, various types of systems and their properties for signal transmission and convolution and correlation.
4. Demonstrate the concept of ROC (Region of convergence) using Laplace and Z-Transform to analyze the system stability.

UNIT-I

SIGNAL ANALYSIS & FOURIER SERIES:

Analogy between vectors and signals, OrthogonalSignal space, Signal approximation using orthogonal functions, Mean square error, Closed or Complete set of orthogonal functions, Orthogonality in complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit step function, Signum function. Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum

UNIT-II

FOURIER TRANSFORMS & SAMPLING:

Deriving Fourier transform from Fourier series,Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform ofPeriodic signals, properties of Fourier transforms, Fourier transforms involving impulse function andSignum function. Introduction to Hilbert Transform, Sampling theorem – Graphical and analyticalproof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction ofsignal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT-III

SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:

Linear system, impulse response,Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) 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 BPFcharacteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT-IV

CONVOLUTION AND CORRELATION OF SIGNALS:

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property ofFourier transforms. Cross correlation and auto correlation of functions, properties of correlationfunction, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation betweenauto correlation function and energy/power spectral density function. Relation between convolutionand correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT-V

LAPLACE TRANSFORMS:

Review of Laplace transforms, Partial fraction expansion, InverseLaplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints onROC for various classes of signals, Properties of L.T's relation between L.T's, and F.T. of a signal.Laplace transform of certain signals using waveform synthesis.

UNIT-VI

Z–TRANSFORMS:

Fundamental difference between continuous and discrete time signals, discretetime signal representation using complex exponential and sinusoidal components, Periodicity ofdiscrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence.Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform,constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems and Communications – B.P.Lathi.
2. Signals and Systems – A.V.Oppenheim, A.S.Willsky and S.H.Nawab

REFERENCES:

1. Signals and Systems – A Anandh Kumar, PHI Publications..
2. Signals and Systems – Simon Haykin and Van Veen.

SEMESTER-III	L	T	P	C
	3	-	-	3
16EE3T04: ELECTRICAL ENGINEERING				

COURSE OUTCOMES:

students are able to:

1. Calculate the power in Balanced the three phase circuits and synthesize the electrical Networks
2. Demonstrate the principle of operation, constructional details and operational characteristics of DC and AC machines
3. Calculate regulation and efficiency of DC and AC machines
4. Design equivalent circuits for transformer, three phase induction machine

UNIT-I

NETWORK SYNTHESIS:

Positive real function - basic synthesis procedure - LC immittance functions - RC impedance functions and RL admittance function - RL impedance function and RC admittance function - Foster and Cauer methods

UNIT-I

BALANCED THREE PHASE SYSTEMS:

Introduction –Three phase supply- Advantages of Three phase systems - star connection- delta connection – Voltage and Current relationship- Power in three phase systems- Measurement of power in three phase systems-Comparison of star and delta connections

UNIT-III

DC MACHINES:

Introduction- DC machine Construction – Principle of operation (Unidirectional EMF & Torque) – Armature Windings– EMF equation – Types of DC machines (Generator and Motor) – magnetization and load characteristics of DC generators. – Characteristics of DC Motors – basic starting methods for DC shunt motor – losses and efficiency – Swinburne's test – speed control of DC shunt motor – flux and Armature voltage control methods.

UNIT-IV

TRANSFORMERS:

Principle of operation of single phase transformer – types – constructional features – phasor diagram on no-load and load – equivalent circuit, losses and efficiency of transformer – regulation of transformer – OC and SC tests – predetermination of efficiency and regulation.

UNIT-IV

AC MACHINES:

Principle of operation and construction of three-phase induction motors – slip ring and squirrel cage motors – slip-torque characteristics – efficiency calculation – starting methods.

Principle of operation and construction of synchronous generator - EMF equation - Principle of operation of synchronous motor –Voltage regulation - methods of starting.

UNIT-VI

SPECIAL MACHINES:

Principle of operation and construction – Reluctance Motor- Hysteresis Motor- Stepper Motor- Brushless alternator

TEXT BOOKS:

1. V.K.Mehta, "Principles of Electrical Machines" S Chand publishers
2. P .S. Bimbra, "Electrical machinery" Khanna publication
3. J .B. Gupta, "Theory and performance of electrical machines" S.K. Katarina publishers

REFERENCES:

1. Rajendhra Prasad, "Fundamentals of electrical engineering" PHI publishers
2. Nagsarkar, "Basic electrical engineering" Phi publishers

SEMESTER-III	L	T	P	C
	3	-	-	3
16EC3T02: ELECTRONIC DEVICES AND CIRCUITS				

COURSE OUTCOMES

students are able to:

1. Explain the motion of electron under the influence of externally applied fields and also detailed analysis of PN junction diode, various applications and importance of several special semiconductor devices.
2. Describe the half wave and full wave rectifiers with filters and familiar knowledge about the Semiconductor Devices like Diode, BJT, Uni-polar devices like. JFET, MOSFET & UJT, power devices like SCR, TRIAC and DIAC their applications.
3. Evaluate the biasing of an electronic circuits using semiconductor device like FET and BJT, to amplify weak signal without distortion.
4. Discuss and Convert the BJT into its equivalent h parameter model and perform exact and approximate analysis of BJT Amplifiers and also few applications of semiconductor devices.

UNIT-I

CONDUCTION IN SEMICONDUCTORS:

Insulators, Semiconductors and Metals classification using energy band diagrams, mobility and conductivity, Carrier concentrations in an intrinsic semiconductor, donor and acceptor impurities, drift and diffusion, charge densities in a semiconductor, Generation and recombination of charge carriers, Carrier lifetime, Hall effect, Poisson and continuity equation, law of junction, Fermi Dirac function, Fermi level in a semiconductor having impurities

UNIT- II

SEMICONDUCTOR-DIODE CHARACTERISTICS:

Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Space charge, or Transition, capacitance CT, Diffusion Capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, SCR. Construction, operation and characteristics of all the above diodes is required to be considered.

UNIT- III

RECTIFIERS AND FILTERS:

Basic Rectifier setup, Half wave rectifier, ripple factor, full wave rectifier (with and without transformer), Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L-section filter, Pi- section filter, Multiple L- section and Multiple πsection filter, and comparison

UNIT- IV

TRANSISTOR CHARACTERISTICS:

BJT: The Junction transistor. The transistor current components, Transistor Construction, detailed study of the currents in a transistor and transistor equation.

Transistor configurations: Transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through, Photo transistor, typical transistor junction voltage values, UJT characters.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- V

TRANSISTOR AND FET BIASING AND THERMAL STABILIZATION:

Need for biasing, operating point, load line analysis, BJT biasing-methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in VBE,Ic, and β, Stability factors, (S, S', S''), Thermistor and Sensistor Compensation, Thermal runaway, Thermal stability. Relevant problems.

FET BIASING

Introduction, Fixed-Bias configuration, Self-Bias Configuration Voltage- Divider Biasing and stabilization. Relevant problems.

UNIT- VI

SMALL SIGNAL LOW FREQUENCY TRANSISTOR AMPLIFIER MODELS:

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

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc- Graw Hill, Second Edition.
2. Electronic Devices and Circuits-B.P.Singh, Rekha Singh, Pearson Publications, Second Edition.
3. Electronic Devices and Circuits-David A.Bell, Oxford University Press, Fifth Edition.

REFERENCES:

1. Electronic Devices and Circuits- K. Satya Prasad.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.
3. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.
4. Electronic Devices and Circuits -BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, Pearson, 2nd edition.
5. Integrated Electronics- Jacob Millman, C. Halkies, C.D. Parikh, Tata Mc-Graw Hill, 2009.

SEMESTER-III	L	T	P	C
	3	-	-	3
16EC3T03: DIGITAL ELECTRONICS				

COURSE OUTCOMES:

students are able to:

1. Describe the function of basic gates and universal gates.
2. Analyze the behavior of various combinational circuits.
3. Explain the behavior of various sequential circuits.
4. Implement Digital systems using combinational and/or sequential circuits.

UNIT- I

NUMBER SYSTEMS, OPERATIONS, CODES, AND LOGIC GATES:

Decimal numbers, Binary numbers, Decimal – Binary conversion, Binary arithmetic, 1's and 2's complement of binary numbers, Hexadecimal numbers, Octal Numbers, Binary Coded Decimal, Digital codes. Logic gates: Inverter, AND, OR, NAND, NOR, XOR and XNOR gates, The Universal property of NAND and NOR gates, IC versions.

UNIT- II

BOOLEAN ALGEBRA AND LOGIC SIMPLIFICATION:

Boolean operations and expressions, Laws and rules of Boolean algebra, DeMorgan's theorems, Boolean analysis of logic circuits, Simplification using Boolean algebra, Canonical and standard forms of Boolean expressions, Boolean expressions and truth tables, The Karnaugh map, Karnaugh map SOP minimizations, Karnaugh map POS minimizations, Five variable Karnaugh map.

UNIT -III

COMBINATIONAL LOGIC CIRCUITS:

Combinational logic using NAND and NOR gates. Combinational logic circuits, Design procedure, Binary adder-subtractor, Decimal adder, Magnitude comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Code converters, Error detection and correction codes - Parity generation and checking, Hamming codes, IC versions.

UNIT- IV

LATCHES, FLIP-FLOPS AND REGISTERS:

Latches, Edge-triggered flip-flops, Flip-flop operating characteristics, Flip-flop conversions, Excitation tables, Registers: Serial in/ serial out, Serial in/ parallel out, Parallel in/ parallel out, Parallel in/ serial out shift registers, Bidirectional shift register, Universal shift register.

UNIT- V

COUNTERS AND STATE MACHINES:

Shift register counters – Ring counter & Johnson counter, Asynchronous counter operations, Synchronous counter operations, Up/ down counter, Introduction to FSM - Mealy and Moore models, Examples.

UNIT VI

MEMORY AND PROGRAMMABLE LOGIC:

Introduction, Random Access Memory, Read Only Memory, Programmable Logic Array (PLA), Programmable Array Logic(PAL), Introduction to Complex Programmable Logic Devices(CPLD) and Field Programmable Gate Arrays(FPGA).

TEXT BOOKS:

1. Digital fundamentals – Thomas L.Floyd, 11th edition, Pearson.
2. Digital design – Morris Mano M, 4th edition, Pearson

REFERENCES:

1. Ronald J. Tocci, "Digital System Principles and Applications", PHI, Sixth Edition, 1997.
2. Fundamentals of Logic Design", by C. H. Roth, Jr, PWS Publishing Company

SEMESTER-III	L	T	P	C
	-	-	4	2
16EC3L01: ELECTRONIC DEVICES AND CIRCUITS LAB				

COURSE OUTCOMES

After completion of the EDC Lab students can able to:

1. Measure frequency and phase of any waveform using CRO.
2. Measure frequency and phase of any waveform using CRO.
3. Verify the rectifier circuits using diodes and implement them using hardware.
4. Analyze the concepts of SCR and observe its characteristics.

PART A: (Only for viva voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 2 lab sessions):

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP) Bread Boards.
2. Identification, Specifications and Testing of Active Devices, Diodes-(PN diode, Zener, laser, Photo, varactor, tunnel, schottkey) ,BJTs, Low power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs, TRIACs.
3. Single layer and Multi-layer PCBs (Design procedure using PCB 123 software).
4. Study and operation of a) Multimeters (Analog and Digital) b) Function Generator c) Regulated Power Supplies d) Study and Operation of CRO.

PART B: (Any ten experiments)

1. PN Junction diode characteristics A. Forward bias B. Reverse bias.
2. V-I characteristics of Zener diode
3. Transistor CB characteristics (Input and Output)
4. Transistor CE characteristics (Input and Output)
5. Half wave Rectifier with & without filters
6. Full wave Rectifier with & without filters
7. FET characteristics
8. UJT Characteristics
9. CE Amplifier
10. CC Amplifier
11. SCR characteristics

Equipment Required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30v
2. CROs - 0-20M Hz
3. Function Generators - 0-1 M Hz
4. Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Micro Ammeters (Analog or Digital) - 0-20μA, 0-50μA, 0-100μA, 0-200μA
8. Voltmeters (Analog or Digital) - 0-50V, 0-100V, 0-250V
9. Electronic Components - Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, PN diode, Zener, Laser, photo, varacter, tunnel, schottkey, LEDs, MOSFETs, diodes (Ge& Si Type), transistors (NPN & PNP)

SEMESTER-III	L	T	P	C
	-	-	4	2
16EE3L02: ELECTRICAL ENGINEERING LAB				

COURSE OUTCOMES

Students are able to

1. Explain the principle of electromechanical energy conversion of single excited and multi excited machines.
2. Classify the principle of operation, constructional details and operational characteristics of DC generators.
3. Role-Play the principle and characteristics of DC motor. To introduce starting and speed control methods of DC motors.
4. Illustrate the principle of operation and constructional details of transformers. Develop the equivalent circuit and evaluate the performance of transformers.

LIST OF EXPERIMENTS

1. Find the resonant frequency, bandwidth and quality factor in series and parallel R-L-C Circuits.
2. Verify maximum power transfer theorem on D.C and on A.C with resistive and Reactive loads.
3. Verify the Thevinin's and Norton's theorem for the given circuits.
4. Find the impedance (Z) and Admittance (Y) parameters of given network.
5. Determine magnetisation characteristics of DC shunt generator and find its critical field resistance.
6. Determine the efficiency of a D.C Shunt motor by using Swineburn's test.
7. Conduct the brake test on a DC Shunt machine.
8. Conduct the OC and SC test on single phase transformer and find the regulation and efficiency.
9. Conduct a brake test on 3-Phase squirrel cage induction motor and to observe the performance characteristics.
10. Find the regulation of 3-phase alternator by synchronous impedance method.

EQUIPMENT REQUIRED FOR LABORATORIES

1. DC Generator, DC Motor, 3 Phase Induction Motor, Alternator, Signal Phase Transformer.
2. Electrical Measuring instruments and connecting wires.

SEMESTER-III	L	T	P	C
	-	-	4	2
16EC3L02: DIGITAL ELECTRONICS LAB				

COURSE OUT COMES

Students are able to

1. Manipulate numeric information in different forms, e.g. different bases, integers, various codes such as ASCII, gray, and BCD.
2. Manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. Identify, analyze and design combinational circuits like Adders, Subtractors, Encoders, Decoders etc.
4. Design various types of sequential circuits like Flipflops counters and Registers and design and analyze Finite state machines (Moore and Meelay).

LIST OF EXPERIMENTS:

1. Verification of Basic Logic Gates.
2. Implementing all individual gates with Universal Gates NAND & NOR.
3. Design a circuit for the given Canonical form, draw the circuit diagram and verify the De-Morgan laws.
4. Design a Combinational Logic circuit for 4x1 MUX and verify the truth table.
5. Design a Combinational Logic circuit for 1x4 De- MUX and verify the truth table.
6. Verify the data read and data write operations for the IC 74189.
7. Design 4-bit Comparator 7485 and Verify the Truth Table.
8. Design Universal Shift Register 74194 and Verify the Truth Table.
9. Design 3 to 8 Decoder 74138 and Verify the Truth Table.
10. Construct Half Adder and Full Adder using Half Adder and verify the truth table.
11. Verification of truth tables of the basic Flip- Flops with Synchronous and Asynchronous modes.
12. Implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table for racearound condition.
13. Design a Decade Counter and verify the truth table.
14. Design the Mod 6 counter using D-Flip -Flop.
15. Construct 4-bit ring counter with T-Flip –Flop and verify the truth table.
16. Design a 8 – bit right Shift Register using D-Flip -Flop and verify the truth table.

EQUIPMENT REQUIRED FOR LABORATORIES :

1. RPS – 0 – 30 v
2. CRO – 0 – 20 MHZ
3. Multi meters
4. IC's- 7400, 7402, 74189, 7485, 74194, 74138, 7408, 7404, 7432, 7468, 74151, 74153.
5. Digital logic trainers & bread boards.

SEMESTER-IV	L	T	P	C
	3	1	-	4
16EC4T01: ELECTRONIC CIRCUIT ANALYSIS				

COURSE OUTCOMES

Students are able to

1. Describe the frequency response of single stage amplifiers and multistage amplifier using BJTs and FETs in different configurations.
2. Construct Hybrid- π Common Emitter transistor model. Compare and analyze the different types of feedback amplifiers and oscillator circuits.
3. Calculate the efficiency of different types of power amplifiers. Analyze Second harmonic distortions, Higher order harmonic Distortion.
4. Observe the Effect of Cascading Single tuned amplifiers, Double tuned amplifiers on Band width. Differentiate the types of voltage regulators and protection techniques.

UNIT-I

MULTISTAGE AMPLIFIERS:

Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT-II

SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS: **BJT:** Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductances, Hybrid π capacitances, validity of hybrid πmodel, determination of high-frequency parameters in terms of low- frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.**FET**: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT -III

FEEDBACK AMPLIFIERS:

Feedback principle and concept, types of feedback, classification of feedback amplifiers, The transfer gain with feedback and topologies of negative feedback, General Characteristics of negative feedback amplifiers, Generalized analysis (Summery of effect of negative- feedback on Gain, Input resistance, Output Resistance & Bandwidth) of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT-IV

OSCILLATORS:

Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein-bridge oscillator, tuned oscillator circuit with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET and their analysis, Crystal oscillators and Uni-junction Oscillator. Frequency and amplitude stability of oscillators.

UNIT-V

POWER AMPLIFIERS:

Classification of amplifiers, Class A power Amplifiers(Series Fed class A power amplifier & Transformer Coupled Class A power Amplifier) and their analysis, Harmonic Distortions, Class B Push-pull amplifier operation and their analysis, Complementary symmetry push pull amplifier and their analysis, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Advanced power amplifiers, Distortion in amplifiers.

UNIT-VI

TUNED AMPLIFIERS AND VOLTAGE REGULATORS: Introduction, Q-Factor, Small Signal Tuned Amplifier – Capacitance single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, and staggered tuned amplifiers, Stability of tuned amplifiers. Voltage regulation – Line Regulation, Load Regulation, Types of Regulators, Series voltage regulator , shunt regulators, Overload Voltage protection.

TEXT BOOKS:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata McGraw-Hill, 1972.
2. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy, Pearson Publications.
3. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

REFERENCES:

1. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.
2. Electronic Circuit Analysis and Design – Donald A. Neaman, McGraw Hill.
3. Electronic Circuits-I-Ravish R Singh-Peason Publications.
4. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
5. Electronic circuits Principles and Application - R.D.S.Samuel,B.Sujatha, ElesevierPublications.

SEMESTER-IV	L	T	P	C
	3	1	-	4
16EE4T02: CONTROL SYSTEMS				

COURSE OUTCOMES

Students are able to

1. Describe the mathematical modeling for electrical, mechanical, and electromechanical systems using differential equations and transfer function approach.
2. Demonstrate the stability analysis in time domain for all the test signals also by using Routh -Hurwitz criterion and root locus method.
3. Explain the frequency domain analysis using polar plot, Bode plot, Nyquist stability criterion and design compensation circuits with lag, lead and lag-lead compensation technique.
4. Analyze the control system using state space approach.

UNIT I

MATHEMATICAL MODELING OF CONTROL SYSTEMS:

Introduction, Open Loop and Closed Loop control systems and their differences, Classification of control systems, Feedback characteristics, and Transfer function of linear systems. Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer function of DC Servo motor, Transfer function of AC Servo motor, Synchro transmitter and Receiver, Block diagram algebra and Problems, Signal flow graph – Reduction using Mason's gain formula with Problems

UNIT II

TIME RESPONSE ANALYSIS:

Standard test signals, Time response of first order systems, Time response of second order systems, Time domain specifications, Steady state errors and error constants, Effects of PI, PD and PID controllers, Problems

UNIT III

STABILITY AND ROOT LOCUS TECHNIQUE:

The concept of stability, Location of poles on s-plane for stability, Routh's stability criterion and problems, Limitations of Routh's stability, The Root locus concept, Construction of root loci and simple problems

UNIT IV

FREQUENCY RESPONSE ANALYSIS:

Introduction, Frequency domain specifications, Bode diagrams and Procedure for magnitude and phase plot of Bode plot, Problems on Bode plot, Stability analysis from Polar plots and problems, Nyquist stability criterion and problems

UNIT V

COMPENSATION TECHNIQUES:

Lag and Lead compensators, Lag-Lead compensators, Design of compensators using Bode plots

UNIT VI

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS:

Concepts of state, state variables and state model, State space representation of transfer function, Diagonalization – Solving the Time invariant state equations, State transition Matrix and its Properties, Concept of Controllability and Observability

TEXT BOOKS:

1. Modern control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Automatic control systems, BenjamanC.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1. Control Systems, ManikDhanesh N, Cengage publications.
2. Control Systems principles and design, M. Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
3. Control Systems Engineering, S.Palani, Tata McGraw Hill Publications.
4. Control Systems by A. NagoorKani, RBA Publications.

SEMESTER-IV	L	T	P	C
	3	-	-	3
16EC4T02: PULSE AND DIGITAL CIRCUITS				

COURSE OUTCOMES

Students are able to

1. Describe how to reshape the non sinusoidal signal.
2. Develop and apply the electronic switch by using Diode and Transistor and remembering the sampling gates.
3. Explain the different generating circuits.
4. Demonstrate the voltage & amp; current time base generator.

UNIT I

LINEAR WAVE SHAPING:

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, double differentiation, attenuators, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

NON – LINEAR WAVE SHAPING:

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

UNIT III

SWITCHING CHARACTERISTICS OF DEVICES & SAMPLING GATES:

Diode as a switch, piecewise linear diode characteristics 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.

Logic & Sampling gates: Realization of Logic Gates using DTL, TTL and ECL. Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Four-diode sampling gates; Applications of sampling gates.

UNIT IV

MULTIVIBRATORS:

Analysis & Design of Bistable Multivibrators: Fixed bias& self-biased transistor binary, Commutating capacitors, Triggering in binary, Schmitt trigger circuit, Applications.

UNIT V

MULTIVIBRATORS (CONTD.):

Analysis & design of Monostable Multivibrator: Collector-coupled and Emitter-coupled Monostable multivibrators, Triggering in monostable multi; Analysis & design of Astable multivibrator (Collector coupled and Emitter-coupled) using transistors.

UNIT VI

TIME BASE GENERATORS:

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Current time base generators.

TEXT BOOKS:

1. Pulse Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002 .

REFERENCE BOOKS:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.
2. Wave Generation and Shaping - L. Strauss.
3. Pulse, Digital Circuits and Computer Fundamentals - R.Venkataraman.

SEMESTER-IV	L	T	P	C
	3	-	-	3
16EC4T03: PRINCIPLES OF ANALOG COMMUNICATIONS				

COURSE OUTCOMES

Students are able to

1. Illustrate the communication system, need for modulation, modulation and demodulation techniques in AM.
2. Describe the concepts of AM-DSB- SC, AM-SSB- SC, VSB, Angle modulation and Pulse Modulation techniques.
3. Estimate the effect of noise on AM, DSB-SC, SSB, FM, PM.
4. Explain the transmission and reception of a signal in a communication system by using different types of transmitters and receivers.

UNIT I

AMPLITUDE MODULATION AND DSBSC MODULATION:

Introduction to communication system, Need for modulation, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector. Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

UNIT II

SSB MODULATION AND VSB 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 waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT III

ANGLE MODULATION:

Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves,

Direct FM, Indirect FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM, Relation between FM & PM.

UNIT IV

NOISE IN ANALOG COMMUNICATIONS:

Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise- In phase and quadrature phase components and its Properties, Modeling of Noise Sources, Average Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Noise in DSB and SSB System Noise in AM System, Noise in Angle Modulation System, Noise Triangle in Angle Modulation System, Pre-emphasis and de-emphasis.

UNIT V

RADIO TRANSMITTERS AND RECEIVERS:

Radio Transmitter - Classification of Transmitter, 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 Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

UNIT VI

ANALOG PULSE MODULATION: Frequency Division Multiplexing, Time Division Multiplexing, Types Analog pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, TDM Vs FDM

TEXT BOOKS:

1. Principles of Communication Systems – H Taub. & D. Schilling, GautamSahe, TMH, 2007, 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

REFERENCE BOOKS:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition.
2. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006
3. Electronic Communication System – George Kennedy and Bernard Davis, TMH 2004.
4. Communication Systems – R.P. Singh, SP Sapre, TMH, 2007, 2nd Edition.

SEMESTER-IV	L	T	P	C
	3	-	-	3
16BM4T01: PRINCIPLES OF ECONOMICS AND MANAGEMENT				

COURSE OUTCOMES

Students are able to

1. State the significance of demand and forecast it with various models.
2. Explain the importance of variables in production function and identify the intricacies of various market structures like Monopoly, oligopoly, monopolistic competition and determine the appropriate pricing strategies to be applied in each market.
3. Describe the concept of management and contemporary concepts of human resource management and marketing management.
4. Illustrate the strengths, weaknesses and suitability of various organizational and ownership structures like sole trading, partnership, private company, public limited company and how to identify and prepare for business cycles.

UNIT I:

INTRODUCTION TO ECONOMICS:

Concept, Nature & Scope of Economics - Macro and

Micro Economics-Demand Analysis:Demand Determinants- Law of Demand& its Exceptions - Elasticity of Demand-Types, Demand Forecasting-Methods.

UNIT II:

MARKET STRUCTURES:

Types of Markets-Price Output determination in perfect competition,Monopoly, Monopolistic Competition, Oligopoly-Pricing methods- Break Even Analysis (simple problems).

UNIT III:

INTRODUCTION TO MANAGEMENT:

Concept - Functions of Management - Scientific Management-Principles of Management-Leadership Styles - Functional areas of Management.

Human Resource Management: Definition, Significance and Functions - PM Vs HRM – Recruitment, Selection, Training and Development -Job Analysis - Role and position of HR department – Performance Appraisal.

UNIT IV:

MARKETING MANAGEMENT:

Needs- Wants - Products - Market- Marketing- Production Concept, Product Concept, Sales Concept, Marketing Concept, Societal Marketing Concept-Organizing the Marketing Department - **Marketing Mix**: Product, Price, Place, Promotion (in brief)

Production Management: Concept of production management-Types of Production processes-Plant Location & Layout, Statistical Quality Control.

UNIT V:

FINANCIAL MANAGEMENT:

Financial Statements – Contents of Trading Account, Profit and Loss Account – Balance Sheet (Theory only) - Analysis of Financial statements : Ratio analysis (simple problems) - Concept of Finance - Objectives of Finance-Wealth Maximization Vs. Profit Maximization - Functions of Finance - Role of financial manager - Organization of finance function.

UNIT VI:

FORMS OF BUSINESS ORGANIZATIONS:

Sole Proprietorship, Partnership,Joint Stock Company - Private limited and Public limited Companies, Public enterprises and their types, Business Cycles.

Entrepreneurship- Entrepreneur – Qualities of good entrepreneur - Entrepreneurial Functions, Entrepreneurial Development: Objectives, Training, Benefits - Phases of Installing a Project.

Text Books:

1. P.G.Ramanujam, B.V.R.Naidu & PVR Sastry, **Management Science**, Himalaya Publishing House, Mumbai.
2. A.R. Aryasri, **Managerial Economics and Financial Analysis**, Tata McGraw- Hill, New Delhi.

Reference Books:

1. M.Y.Khan&P.K.Jain, **Financial Management**, TATA McGraw-Hill, New Delhi.
2. Koontz O Donnel, **Management**, TATA McGraw-Hill, New Delhi.
3. K. Aswathappa, **Production Mangement**, Himalaya Publishing House, Mumbai.
4. P.SubbaRao, **Human Resource Management**, Himalaya Publishing House, Mumbai.
5. Philip Kotler, **Marketing Management**, Pearson Prentice Hall, New Delhi.
6. Vasant Desai, **Entreprenuership**, Himalaya Publishing House, Mumbai.
7. Varshini&Maheswari, **Managerial Economics**, SChand& Co, New Delhi.

SEMESTER-IV	L	T	P	C
	-	-	4	2
16EC4L01: ELECTRONIC CIRCUIT ANALYSIS LAB				

COURSE OUTCOMES

Students are able to

1. Design the single stage and multistage amplifier using BJTs and FETs.
2. Differentiate different types of feedback amplifiers, calculate the input resistance and output resistance of feedback amplifiers.
3. Generate the wave forms of oscillator with different frequencies. Obtain the efficiency of the single stage power amplifiers.
4. Construct and analyze the characteristics of tuned amplifiers, observe the properties of Series Voltage Regulator and Shunt Voltage Regulator.

Note: The students are required to design the electronic circuit and they have to perform the simulation using Multisim /Pspice / Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory.

PART A:

LIST OF EXPERIMENTS: (MINIMUM OF TEN EXPERIMENTS HAS TO BE PERFORMED)

1. Determination of fT of a given transistor
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. Current- Series Feedback amplifier
5. Voltage Shunt Feedback amplifier
6. RC Phase Shift/Wien Bridge Oscillator
7. Hartley/Colpitt's Oscillator
8. Two Stage RC Coupled Amplifier
9. Darlington Pair Amplifier
10. Bootstrapped Emitter Follower
11. Class A Series-fed Power Amplifier
12. Transformer-coupled Class A Power Amplifier
13. Class B Push-Pull Power Amplifier
14. Complementary Symmetry Class B Push-Pull Power Amplifier
15. Single Tuned Voltage Amplifier

16. Double Tuned Voltage Amplifier
17. Shunt Voltage Regulator
18. Series Voltage Regulator

PART B:

EQUIPMENT REQUIRED FOR LABORATORY

Software:

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

HARDWARE:

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

ACTIVE & PASSIVE ELECTRONIC COMPONENTS

SEMESTER-IV	L	T	P	C
	-	-	4	2
16EC4L02: PULSE AND DIGITAL CIRCUITS LAB				

COURSE OUTCOMES

Students are able to

1. Design the circuits for linear and non-linear wave shaping circuits like high pass RC, low pass RC, clippers and clampers.
2. Generate non-sinusoidal signal using UJT and observing the output of sweep circuit using transistors. Observe the Bistable, Astable and Monostable Multi vibrator circuits using transistors.
3. Generate non-sinusoidal signal using UJT and observing the output of sweep circuit using transistors. Observe the Bistable, Astable and Monostable Multi vibrator circuits using transistors.
4. Observe the Multi vibrator circuits using IC 555 Timer and applications of PLL and VCO.

LIST OF EXPERIMENTS:

1. Linear wave shaping (low pass & high pass)
2. Non- linear wave shaping-clippers
3. Non- linear wave shaping-clampers
4. Transistor as a switch
5. Realization of Logic Gates.
6. Sampling gates (uni-directional & bi- directional)
7. Astable multivibrator
8. Mono-stable multivibrator
9. Bi-stable multivibrator
10. Schmitt –trigger using BJT
11. Relaxation oscillator using UJT
12. Boot strap sweep circuit
13. Study of flip-flops and some applications.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. RPS – 0 – 30V
2. CRO – 0 – 20MHZ
3. Function Generators– 0 – 1MHZ
4. Multimeters
5. Decade Resistance boxes
6. Decade Capacitor boxes
7. Micro ammeters (Analog or Digital) – 0-20μA, 0-50μA, 0-100μA, 0-200μA.
8. Voltmeters (Analog or Digital) 0-50V, 0-100V, 0-250V.
9. Electronic Components – Resistors, Capacitors, BJTs, LCDs SCRs, VJTs, PN Diode, Zener, Laser, Photo, Varacter, Tunnel, Schottlry, LED's, MOSFETs, Diodes (Ge & Si type), Transistors, (NPN & PNP).

SEMESTER-IV	L	T	P	C
	-	-	4	2
16EC4L03: ANALOG COMMUNICATIONS LAB				

COURSE OUT COMES

Students are able to

1. Use and analyze different analog modulation techniques.
2. Perform various modulation and demodulation techniques.
3. Analyze the various modulated signals.
4. Get the idea about pre-emphasis and de-emphasis techniques to solve noise effects in frequency modulation technique.

LIST OF EXPERIMENTS

TWELVE EXPERIMENTS TO BE DONE: (A. HARDWARE, B. MATLAB SIMULINK)

1. Amplitude Modulation and Demodulation.
2. AM - DSBSC Modulation and Demodulation.
3. Spectrum Analysis of Modulated signal using Spectrum Analyzer.
4. Diode Detector Characteristics.
5. Pre-emphasis and De-emphasis.
6. Frequency Modulation and Demodulation.
7. SSB system.
8. Sampling Theorem.
9. Pulse Amplitude Modulation and Demodulation.
10. Pulse Width Modulation and Demodulation.
11. Pulse Position Modulation and Demodulation.
12. Phase Locked Loop.

Equipment Required for Laboratories:

1.RPS -0 –30 V.

2.CRO -0 –20 M Hz.

3.Function Generators -0 – 1 M Hz.

4.RF Generators -0 – 1000 M Hz. /0 – 100 M Hz.

5.Multimeters.

6.Lab Experimental kits for Analog Communication.

7.Components.

8.Spectrum Analyzer -60 M Hz.

SOFTWARE REQUIRED:

1. Computer systems with latest specifications.
2. Connected in LAN (optional).
3. Operating system (windows XP).
4. Simulations software (MATLAB- Simulink).

SEMESTER-V	L	T	P	C
	3	1	-	4
16EC5T01: ELECTROMAGNETIC WAVES & TRANSMISSION LINES				

COURSE OUTCOMES:

Students are able to

CO1. Explain the basics of electrostatic & electromagnetic.

CO2. Demonstrate Maxwell equations and different postulates of EM fields.

CO3. Describe the behavior of EM waves propagation in conducting and dielectric media.

CO4. Analyze the propagation problems of EM waves through transmission lines and its design.

UNIT –I

ELECTROSTATICS AND MAGNETO STATICS:

ELECTROSTATICS: Coulomb's Law, Electric Field Intensity, Fields due to Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Energy density, Dielectric Constant, Poisson's and Laplace's Equations. Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Magnetic Scalar and Vector Potentials.

UNIT-II

MAXWELL'S EQUATIONS (STATIC & DYNAMIC FIELDS):

Faraday's Law, Inconsistency of Ampere's Law, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface: Dielectric-Diel ectric and Dielectric-Conductor Interfaces. and Related Problems.

UNIT –III

EM WAVE CHARACTERISTICS - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves and Definition, Relations between E & H. Wave Propagation in Lossless and Conducting Media. Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Depth of penetration, Polarization. and Related Problems.

UNIT- IV

EM WAVE CHARACTERISTICS – II:

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Poynting Vector and Poynting Theorem and its Applications.

UNIT- V

TRANSMISSION LINES - I :

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

UNIT- VI

TRANSMISSION LINES – II:

Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements, λ/4, λ/2, λ/8 Lines, Impedance Transformations. Single and Double Stub Matching, Smith chart, Configuration and Applications.

TEXT BOOKS:

1. Elements of Electromagnetics -Matthew N.O.Sadiku, Oxford Univ.Press, 3rd ed, 2001. **(UNIT-1, UNITS-II, V&VI)**

2. Electromagnetic Waves and Radiating Systems -E.C.Jorden and K.G.Balmain, PHI 2nd Edition, 2000. **(UNIT-III & IV)**

REFERENCE BOOKS:

1. Networks, Lines and Fields by John .D. Ryder II Edition

2. Electromagnetic Field Theory and Transmission Lines-G. S. N. Raju, Pearson Ed. P te. Ltd., 2005

SEMESTER-V	L	T	P	C
	3	1	-	4
16EC5T02: ELECTRONIC MEASUREMENTS & INSTRUMENTATION				

COURSE OUTCOMES

Students are able to

CO1. Apply VARIOUS METERS TO MEASURE Voltage and Current depending on basic characteristics.

CO2.Construct various types of signals used to test the designed systems and analyze various characteristics of output signal by using different wave analyzers.

CO3. Explain about different types of oscilloscopes and their different applications in various fields.

CO4. Use different Transducers and Bridges for measurement of different physical parameters like resistance, inductance, capacitance, force, temperature and frequency etc...

UNIT – I

PERFORMANCE CHARACTERISTICS OF INSTRUMENTS:

static and dynamic characteristics, errors in measurement, AC & DC voltmeters, AC & DC ammeters.

UNIT – II

SIGNAL GENERATORS AND WAVE ANALYZERS :

Function generator, Pulse generator, random noise generator, sweep generator, wave analyzers, harmonic distortion analyzer, Spectrum analyzer.

UNIT – III

OSCILLOSCOPES-I:

CRT features, vertical amplifier, horizontal deflection system, sweep circuit, trigger circuit, delay line, sync selector circuit, simple CRO, measurement of amplitude and frequency.

UNIT –IV

OSCILLOSCOPES-II: Dual beam CRO, dual trace CRO, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency and phase measurement, active and passive CRO probes and frequency counter.

UNIT-V

AC AND DC BRIDGES:

Maxwell's bridge, Anderson bridge, Schering bridge, Wheatstone bridge, Wein bridge, Q-meter.

UNIT –VI

TRANSDUCERS AND MEASUREMENTS: Temperature measurement thermocouples, thermistor, pressure measurement – diaphragms, capacitive pressure transducers, bellows, bourdon tube, Mass measurement, load cells, accelerometers, Displacement transducers the resistive potentiometer, LVDT, variable capacitive transducer, variable inductive transducer, strain gauges and Piezo -electric transducers

TEXT BOOKS:

1. Modern Electronic Instrumentation and Measurement Techniques - A.D Helfrick and W.D Cooper, PHI, 5th Edition, 2002**.(UNITS - I,III,IV&V)**
2. Electronic Instrumentation, Second Edition-H.S Kalsi, Tata McGraw Hill-2004**. (UNITS - I, II, IV&VI)**

REFERENCES:

1. Electronic Instrumentation & Measurements – David A Bell, PHI, 2nd Edition, 2003.
2. Electronics Test Instruments, Analog and Digital Measurements –Robert A. Witte , Pearson Education, 2nd Edition, 2004.

SEMESTER-V	L	T	P	C
	3	-	-	3
16EC5T03: DIGITAL COMMUNICATIONS				

COURSE OUTCOMES:

Students are able to

CO1. Describe various analog to digital conversion techniques and explain different modulation techniques in different applications.

CO2. Analyze the probability of error in reception of signals by using different filters and describe different information theory concepts.

CO3. Apply the different source coding techniques in the data compression during transmission.

CO4. Explain the channel coding techniques for error detection and correction in digital communication.

UNIT – I

WAVEFORM CODING TECHNIQUES:

Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM), Delta modulation, its draw backs, Adaptive Delta modulation, comparison of PCM and DM Systems, noise in PCM and DM systems.

UNIT – II

DIGITAL MODULATION TECHNIQUES:

Introduction, ASK, FSK, PSK, DPSK, QPSK, M-ary PSK, FSK, QAM, Similarity of BFSK and BPSK, Comparison of all digital modulation techniques.

UNIT – III

PERFORMANCE OF DIGITAL SYSTEMS:

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, BFSK,BPSK, QPSK.

UNIT – IV

INFORMATION THEORY AND SOURCE CODING:

Information theory-Discrete messages, concept of amount of information and its properties. Average information (Entropy) and its properties. Information rate, Mutual information and its properties. Source coding-Introductions, Advantages, Shannon's theorem, Shannon-Fano coding,

Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, Capacity of a Gaussian channel, bandwidth–S/N trade off.

UNIT – V

LINEAR BLOCK CODES:

Matrix description of Linear Block codes, Error detection and correction capabilities of Linear block codes, single error correcting Hamming codes, Binary cyclic codes, Algebraic structure of cyclic codes, encoding using (n-k) bit shift register, syndrome calculation, error detection and error correction.

UNIT – VI

CONVOLUTIONAL CODES:

Encoding of Convolutional codes, time domain approach, transform domain approach. Graphical approach: code tree, trellis and state diagram, maximum likelihood decoding of Convolutional codes, and its Viterbi decoding.

TEXT BOOKS:

1. Digital communications, Simon Haykin, John Wiley, 2005, 1st Edition**.(UNITS - I,II,III)**
2. Digital communication by R.S. Chitode, Technical Publications, Second Revised Edition 2009**. (UNITS - IV,V&VI)**

REFERENCES:

1. Digital and Analog Communication Systems, K.Sam Shanmugam John Wiley, 2005, 1st Editon.
2. Principles of Communication Systems, H. Taub and D. Schilling, TMH, 3rd Edition. 2003.

SEMESTER-V	L	T	P	C
	3	-	-	3
16EC5T04: LINEAR & DIGITAL IC APPLICATIONS				

COURSE OUTCOMES:

Students are able to

CO1: Demonstrate different applications based on operational-amplifier.

CO2: Explain the applications of waveform generators based on operational-amplifier and IC 555 timer.

CO3:Differentiate A/D and D/A converter, understand their types and analyze their Applications.

CO4: Represent any combinational and sequential circuits using digital ICs.

UNIT- I

INTEGRATED CIRCUITS:

Integrated circuits-Types, Classification, Package Types and temperature ranges, Differential Amplifier- DC and AC analysis of Dual input 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 AMPLIFIER AND ITS APPLICATIONS:

Characteristics of OP-Amps, Op-amp Block Diagram, ideal and practical Op-amp specifications Op-Amp parameters,(DC and AC characteristics) 741 op-amp & its features. Linear Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Summing and Difference amplifier. Non-Linear Applications of Op-Amps: Comparators, Triangular and Square wave generators. Sine wave generation: principle, Wein-bridge, phase-shift oscillators.

UNIT- III

ACTIVE FILTERS AND TIMERS:

Introduction, classification, Butter worth filters – 1st order, LPF, HPF, Band pass, Band reject and all pass filters qualitative and quantitative analysis. Timers**:** Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger.

UNIT - IV

A to D & D to A CONVERTERS:

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

UNIT-V

COMBINATIONAL LOGIC DESIGN:

Introduction, Design and Analysis procedures, Decoders, encoders, multiplexers and demultiplexer, comparators, Ripple Adder, Binary Parallel Adder, Binary Adder-Subtractor**,** Combinational multipliers, Design considerations of the above combinational logic circuits with relevant Digital ICs.

UNIT – VI

SEQUENTIAL LOGIC DESIGN:

Introduction to flip-flops, Design of Counters using Digital ICs, Counter applications, Synchronous design methodology, Universal Shift Register, Ring Counter, Johnson Counter, Design considerations of the above sequential logic circuits with relevant Digital ICs.

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Chowdary, New Age International (p) Ltd, 2nd Edition, 2003. **(UNITS- II, III & IV)**
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.(**UNITS-I,II&III)**
3. Digital Design Principles & Practices – John F. Wakerly , PHI/ Pearson Education Asia, 3rd Edition , 2005. **(UNITS-V&VI)**

REFERENCES:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, Mc.Gh
2. Digital fundamentals-Floyd and Jain Pearson education 8th Edition 2005.

B. TECH SEMESTER-V	L	T	P	C
	3	-	-	3
ELECTIVE-I 16CS5E06: OPERATING SYSTEMS				

COURSE OUTCOMES

Students are able to

CO1. Define fundamental concepts about operating systems.

CO2. Describe process management and CPU scheduling.

CO3. Describe concurrency control mechanisms.

CO4. Analyze memory management Technique.

CO5. Analyze Deadlocks and Write solution to it.

CO6. Define file systems interface and Implementation.

UNIT-I

COMPUTER SYSTEM AND OPERATING SYSTEM OVERVIEW:

Overview of computer operating systems, operating systems functions, protection and security, distributed systems, special purpose systems, operating systems structures and systems calls, operating systems generation.

UNIT-II

PROCESS MANAGEMENT:

Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

UNIT-III

CONCURRENCY:

Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples

UNIT-IV

MEMORY MANAGEMENT:

Swapping, contiguous memory allocation, paging, structure of the page table, segmentation

Virtual Memory Management:virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing

UNIT-V

PRINCIPLES OF DEADLOCK:

System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock,

UNIT-VI

FILE SYSTEM INTERFACE:

the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation- File system structure, allocation methods, free-space management **Mass-storage structure** overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin,Gagne 7th Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education.

SEMESTER-V	L	T	P	C
	3	-	-	3
ELECTIVE - I **16CS5E05: COMPUTER ORGANIZATION& ARCHITECTURE**				

COURSE OUTCOMES:

Students are able to:

CO1. Describe the structure of computers.

CO2. Analyze the quantitative performance evaluation of computer systems.

CO3. Define the addressing modes and instructions for writing programs.

CO4. Demonstrate the Peripheral devices for efficient operation of system.

CO5. Explain the binary and hexadecimal number systems including computer arithmetic

CO6. Analyze Micro operations such as Arithmetic micro operations, Shift micro operations and Logic micro operations.

UNIT I

BASIC STRUCTURE OF COMPUTERS:

Basics of computer, Von Neumann Architecture, Generation of Computer, Types of Compute, Functional unit, Basic Operational Concepts and Bus Structures.

UNIT II

REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS:

Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and control, Instruction Cycle, Memory – Reference, Input – Output and Interrupt Instructions. Design of basic computer, Design of Accumulator logic.

UNIT III

ENTRAL PROCESSING UNIT:

General Register Organization, STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation, Program control, Reduced Instruction Set Computer.

Micro Programmed Control: Control Memory, Address sequencing, micro program example, design of control unit.

UNIT IV

COMPUTER ARITHMETIC: Addition and Subtraction, multiplication algorithms, Division Algorithms. Floating point arithmetic operations. Decimal Arithmetic unit, Decimal arithmetic operations.

UNIT V

INPUT- OUTPUT ORGANIZATION:

Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct memory Access.

The Memory System: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory and Virtual Memory.

UNIT VI

PARALLEL PROCESSING AND VECTOR PROCESSING:

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

TEXT BOOKS:

1. Computer System Organization, M.Moris Mano, 3rd Edition, Pearson / PHI

2. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.

3. Computer Organization, a quantitative approach, John L.Hennessy and David A.Patterson, Fourth Edition Elsevier

REFERENCE BOOKS:

1.Computer Organization and Architecture - William Stallings Sixth Edition, Pearson / PHI

2.Structured Computer Organization - Andrew s. Tanenbaum, 4th Edition, PHI/ Pearson.

3.Fundamentals of Computer Organization and Design,-SivaraamaDandamudi,Springer Int. Edition.

SEMESTER-V	L	T	P	C
	3	-	-	3
ELECTIVE - I **16EC5E01: TELECOMMUNICATION SWITCHING SYSTEMS**				

COURSE OUTCOMES:

Students are able to

CO1: Explain the basic elements of switching systems and the operation of various switching techniques.

CO2: Analyze the signaling techniques, like routing, transmission plan, numbering plans and charging plans in telephone networks.

CO3: Describe layered network architecture and various types of data networks and analyze ISDN and BISDN.

CO4: Illustrate DSL and SONET and study respective networks and frame transmissions involved.

UNIT-I

TELECOMMUNICATION SWITCHING SYSTEMS:

Introduction, Elements of switching systems, switching network configuration, principles of cross bar switching, Electronic space division switching, Time division switching, Combination switching.

UNIT-II

TELEPHONE NETWORKS AND SIGNALING TECHNIQUES:

Subscriber loop systems, switching hierarchy and routing, transmission plan, numbering plan, charging plans, In channel signaling, common channel signaling, Network traffic load and parameters, grade of service and blocking probability.

UNIT-III

DATA COMMUNICATION NETWORKS:

Introduction, network architecture, layered network architecture, Data Communication Protocols, Data Communication hardware circuits, Public switched data networks, connection oriented & connection less service.

UNIT-IV

COMPUTER NETWORKS:

OSI reference model, LAN, WAN, MAN & Internet, Circuit Switching, Packet switching, Message switching and virtual circuit switching concepts, repeaters, Bridges, Routers and gate ways.

UNIT-V

INTEGRATED SERVICES DIGITAL NETWORK (ISDN):

Introduction, motivation, ISDN architecture, ISDN interfaces, functional grouping, reference points, protocol architecture, signaling, numbering, addressing, BISDN.

UNIT-VI

DSL TECHNOLOGY:

ADSL, Cable Modem, Traditional Cable Networks, HFC Networks, Sharing, CM & CMTS and DOCSIS,SONET- Devices, Frame, Frame Transmission, Synchronous Transport Signals, STS I, Virtual Tributaries and Higher rate of service.

TEXT BOOKS:

1. Advanced electronic communications systems - Wayne Tomasi, PHI, 2004.**(UNITS - I,II& III)**
2. Data communication and networking—BEHROUZ A FOROUZAN, 4th Edition, Tata McGraw Hill. **(UNITS - IV,V,&VI)**

REFERENCES;

1.Telecommunication Switching System and Networks - Thyagarajan Viswanathan, PHI, 2000.

SEMESTER-V	L	T	P	C
	3	-	-	3
16EC5E02: DIGITAL SYSTEM DESIGN USING VERILOG				

COURSE OUTCOMES:

Students are able to:

CO1. Describe about fundamental Verilog HDL Programming basics and different tools used in developing HDL Programs.

CO2. Summarize different Verilog Programming models and different applications.

CO3. Design and develop any digital circuit using both concurrent and Sequential Programming concepts.

CO4. Explain about various Testing techniques used in testing digital circuits.

UNIT – I

Introductionn and History of Verilog HDL , Design flow , levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools.Different styles of coding in verilog. Introduction, Keywords, Identifiers, Comments, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators**.**

UNIT – II

Gate Level Modeling: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Delay, Strengths and Construction Resolution, Net Types, Design of basic Circuit. Design gate level programs developing Dataflow coding with Introduction of Continuous Assignment Structure, Delays and Continuous Assignment**.**

UNIT-III

Behavioral Modeling: Introduction, Conditional statements, Operations and Assignments ,Functional Bi-furacation, 'Intial' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Design at Behavioral Level, Blocking and Non-Blocking Assignments, the 'Case' Statement, Simulation Flow, 'If' an 'if-Else' Constructs.

UNIT – IV

Switch Level Modeling: Basic Transistor Switches, CMOS Switches, Bi-Directional Gates, Time Delays with Switch Primitives, Instantiation with 'Strengths' and 'Delays' Strength Contention with Tri-reg Nets.System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters,System Tasks and Functions.

UNIT – V

Sequential Circuit Description: Sequential Models, Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.Mixed model programs**.**

UNIT-VI

Introduction to Components Test and Verificationon, Test Bench - Combinational Circuits Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.BIST and BILBO techniques..

TEXT BOOKS:

1. .R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley 2009.
2. Zainalabdien Navabi, Verliog Digital System Design,TMH, 2nd Edition,IV,V,VI)
3. Fundamentals of Digital Logic with Verilog Design - Stephen Brown,Zvonkoc Vranesic, TMH, 2nd Edition.

REFERENCE BOOKS:

1. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
2.Advanced Digital Design with Verilog HDL - Michel D. Ciletti, PHI,2009.

SEMESTER-V	L	T	P	C
	-	-	4	2
16EC5L01: DIGITAL COMMUNICATIONS LAB				

COURSE OUTCOMES:

Students are able to

CO1: Define basic Time division multiplexing system.

CO2: Analyze different analog to digital conversion techniques and Companding as an alternative to non uniform quantization.

CO3: Analyze different digital modulation techniques.

CO4: Apply the source coding techniques for data compression and channel coding techniques for error detection and correction.

List of Experiments

1. To perform Time Division Multiplexing & De-multiplexing and to plot the waveforms.
2. To study the Pulse Code Modulation and to compare practical and theoretical values.
3. To perform Differential Pulse Code Modulation & demodulation and to plot the waveforms.
4. To perform Delta Modulation and Demodulation
5. To perform ASK Modulation and Demodulation.
6. To perform FSK Modulation and Demodulation.
7. To study the operation of Phase shift keying Modulator and Demodulator.
8. To study the operation of Differential Phase shift keying Modulator and Demodulator.
9. To perform Companding using A-law and μ-law.
10. Study of source coding Encoder and Decoder.
11. Study of Linear block code Encoder and Decoder.
12. Study of Convolution code Encoder and Decoder

Equipment required for Laboratories:

1. RPS - 0 - 30. V
2. CRO - 0- 20 MHz
3. Function Generators - 0- 1 MHz
4. RF Generators - 0- 1000M Hz/0 - 100 M Hz
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components
8. Matlab and Multi-sim

ADDITIONAL EXPEREMENTS

1. Cyclic code - Encoding and Decoding
2. BFSK Using Matlab
3. QPSK Using Matlab.

SEMESTER-V	L	T	P	C
	-	-	4	2
16EC5L02: LINEAR AND DIGITAL IC APLICATIONS LABORATORY				

COURSE OUTCOMES:

Students are able to

CO1: Design circuits using operational amplifiers for various Applications.

CO2: Design various combinational circuits using various Digital Integrated IC's.

CO3: Know the differences between Linear and Digital Integrated IC's.

CO4: demonstrate their knowledge by designing analog circuits & digital circuits.

Minimum Ten Experiments to be conducted (7 from Part-A & 3 from Part-B)

PART (A)

1. Verify the operation of op – amp as an adder, subtracrtor and Comparator.
2. Differentiate the operation of op – amp as an Integrator and Differentiator using IC 741.
3. Realize an op – amp as first order Butterworth low pass and high pass filters For a given cut off frequency and verify the frequency response characteristics.
4. Design and realize an op – amp based first order Butterworth band pass filter for a given cut off Frequency and verify the frequency response characteristics.
5. Infer how IC 741 op – amp can be used as RC phase shift oscillator for a desired Frequency
6. Examine the operation of an op – amp based function generator to generate sine, square and Triangular waves of desired frequency.
7. Design and verify an IC 555 timer based pulse generator for the specified pulse.
8. Develop a square wave for the specified frequency using IC 555.
9. Construct a DAC using R – 2R ladder network and verify its operation.

PART (B)

10. Construct XOR/XNOR gates with universal gates.
11. Examine the operation of IC-74151 as 8X1 line Multiplexer.
12. Implement 4 Bit decade Up/Down Counter using T-Flip-flops.
13. Develop half subtractor & Full subtractor using logic gates.

ADDITIONAL EXPERIMENTS

1. Design and realize Schmitt trigger circuit using an op – amp for desired upper trip point (UTP) and lower trip point (LTP).
2. Construct 4 bit Comparator using 2 bit comparators.

DESIGN EXPERIMENTS

1. Implement 2's complement adder/subtractor using logic gates.
2. Designing of Fixed voltage power supply (voltage regulator) using IC regulators 78 series and 79 series.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, 74 series TTL ICs and other essential components.
8. Analog and Digital IC Testers.

SEMESTER-V	L	T	P	C
	2	-	-	-
MANDATORY COURSE: PROFESSIONAL ETHICS &INTELLECTUAL PROPERTY RIGHTS				

COURSE OUTCOMES:

Students are able to

CO1. Identify the professional roles played by an engineer and illustrate the process of Social experimentation

CO2.Determine Engineer's responsibilities and rights towards the society

CO3.Analyze various aspects of Intellectual Property Rights and recognize the process of protecting the copyrights

CO4.Describe the registration process of Patents and trademarks and also demonstrate the concept of trade secrets and cybercrimes

UNIT-I

ENGINEERING ETHICS:

Importance of Engineering Ethics–Professional and Professionalism –Professional Roles to be played by an Engineer –Professional Ethics.

UNIT-II

ENGINEERING AS SOCIAL EXPERIMENTATION :

Role of engineering in knowledge society- Knowledge acquired – Conscientiousness – Relevant Information –Engineers as Managers, Consultants, and Leaders.

ENGINEERS' RESPONSIBILITY FOR SAFETY AND RISK: Role and importance of Safety and risk- Types of Risks –Threshold Levels for Risk– RiskBenefit Analysis.

UNIT-III

ENGINEERS' RESPONSIBILITIES AND RIGHTS:

Collegiality-Conflict of Interest-solving conflict problems – Ethical egoism-Collective bargaining - Confidentiality-Acceptance of Bribes/Gifts--Occupational Crimes-industrial espionage-Whistle Blowing-types of whistle blowing.

UNIT IV

INTELLECTUAL PROPERTY AND COPY RIGHTS:

Introduction to Intellectual Property Law - Types ofIntellectual Property – Infringement,Copyrights:Introduction to Copyrights – Principles of Copyright – Rights Afforded byCopyright Law –Copyright Formalities and Registration.

UNIT-V

PATENTS AND TRADEMARKS:

Introduction to Patent Law –Rights under Patent Law – Patent Requirements – Patent Application Process and Granting of Patent – Double Patenting – Patent Cooperation Treaty**.** Trademarks:Introduction to Trade Mark – Trade Mark Registration Process – Trade Markmaintenance – Likelihood of confusion

UNIT-VI

TRADE SECRETS AND CYBER LAW:

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security –Unfair Competition –Breach of Contract .Cyber law**:**Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security .

TEXT BOOKS:

1. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009. **(UNIT -I,II &III)**
2. Deborah E.Bouchoux: "Intellectual Property". Cengagelearning , NewDelhi, BS Publications (Press) **(IV,V&VI)**
3. PrabhuddhaGanguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi**(IV,V&VI)**

SEMESTER-VI	L	T	P	C
	3	1	-	4
16EC6T01: ANTENNAS & WAVE PROPAGATION				

COURSE OUTCOMES:

Students are able to

CO1. Describe different types of antenna parameters.

CO2. Solve the fields radiated by various types of antennas.

CO3. Explain various categories of antennas and antenna arrays.

CO4. Analyze antenna measurements to identify the characteristics of radio wave propagation.

UNIT-I

ANTENNA FUNDAMENTALS:

Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height.

UNIT-II

THIN LINEAR WIRE ANTENNAS:

Retarded Potentials, Radiation from Small Electric Dipole and Half wave Dipole, Evaluation of Field Components: Power Radiated, Radiation Resistance, Beam widths, Directivity, Effective Area and Effective Height. Antenna Theorems – Reciprocity and Maximum power transfer theorems, Loop Antennas: Small Loops - Directivity and radiation resistance for small loops.

UNIT-III

ANTENNA ARRAYS :

Two element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Binomial Arrays. Arrays with Parasitic Elements, Yagi - Uda Arrays, Folded Dipoles & their characteristics.

UNIT-IV

NON-RESONANT RADIATORS:

Introduction, Travelling wave radiators – basic concepts, Long wire antennas– field strength calculations and patterns, Microstrip antennas-introduction, features, advantages and limitations, Rectangular patch antennas Geometry and parameters. Broadband Antenna: Helical Antenna – Geometry, basic properties and operational modes (axial & normal modes).

UNIT- V

VHF, UHF AND MICROWAVE ANTENNAS:

Reflector Antennas: Flat Sheet and Corner Reflectors. Paraboloidal Reflectors– Geometry, characteristics, f/d Ratio, Spill Over, Back Lobes, Aperture Blocking, Types of feeds: Off-set Feeds and Cassegrain Feeds. Horn Antennas – Types, Design Characteristics of Pyramidal Horn, Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements.

UNIT-VI

WAVE PROPAGATION:

Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, wave tilt. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF & Skip Distance – Calculations for flat and spherical earth cases. Space Wave Propagation – Mechanism, LOS and Radio Horizon, Field Strength, Fundamental Equation for Free-Space Propagation, Duct Propagation.

TEXT BOOKS:

1. Antennas for all applications –John D.Kraus and Ronald J.Marhefka, 3rd Edition 2003.
2. Antennas and wave propagation-K.D.Prasad, Satya Prakashan,Tech India Publications, New Delhi, 2001.

REFERENCES :

1. Antennas and wave propagation- G.S.N.Raju, Pearson Education, South Asia.
2. Electromagnetic Waves and 2. Radiating systems-E.C.Jordan and K.G.Balmain PHI, 2nd Edition 2000.

SEMESTER-VI	L	T	P	C
	3	1	-	4
16EC6T02: MICROPROCESSORS & MICROCONTROLLERS				

COURSE OUTCOMES:

Students are able to

CO1. Explain architecture, instructions and addressing modes of various Microprocessors and Microcontrollers.

CO2. Develop Assembly programs for various industrial requirements.

CO3. Analyze 8086 interfacing with different peripherals and implement programs.

CO4. Design a minimum workable system with Microprocessors & Microcontrollers.

UNIT-I.

INTRODUCTION TO MICROPROCESSORS:

Little Endian and Big Endian Formats , Von-Neumann and Harvard architectures, RISC Vs CISC processors, Family of Intel processors.

8085 Microprocessor: Register organization, Architecture and signal description, General bus operation, I/O addressing capability, Timing diagrams.

UNIT-II

8086 MICROPROCESSOR:

Register organization, Architecture and Signal description, Physical memory organization, General bus operation, I/O addressing capability, Special purpose activities.

UNIT-III

MINIMUM MODE AND MAXIMUM MODE OF 8086:

Timing diagrams, Addressing modes of 8086, Instruction set of 8086, Assembler directives, Procedures and Macros, Assembly language programming.

UNIT-IV

BASIC PERIPHERALS AND INTERFACING WITH 8086:

Memory interfacing, 8255-PPI, Interfacing to D/A and A/D converters, Stepper motor interfacing, Control of high power devices using 8255.

UNIT-V:SPECIAL PURPOSE PROGRAMMABLE INTERFACING DEVICES:

Interrupts and interrupt service routines Interrupt cycle of 8086, non-maskable interrupt, maskable interrupts, interrupt programming. 8259 – PIC, 8251 – USART, 8237 – DMA controller.

UNIT-VI

8051 MICROCONTROLLER:

Introduction to microcontrollers, 8051 microcontroller, 8051 pin description, connections, I/O ports, Memory organization, Interrupts, Timers, Serial port, Programming with Embedded C.

TEXT BOOKS:

1. Microprocessor Architecture, programming and applications with the 8085 by Ramesh Goankar, 5th edition, Penram International Publications 2000 **(UNIT - I)**
2. Advanced Microprocessors And Peripherals by A .K .Ray, K.M.Bhurchandi,Tata McGraw Hill Publishers, 2006. **(UNITS - II,III,IV & V)**
3. 8051 Micro Controllers -Kenneth J. Ayala, Penram International/ Thomson,1995. **(UNIT - VI)**

REFERENCE BOOKS:

1. Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286,80386, 80486, and Pentium processors. Architecture, programming and interfacing".
2. Douglas V Hall, "Microprocessors and Interfacing: Programming and Hardware", 2nd edition, TMH.
3. Microcontrollers by Ajay V Deshmukh, TATA McGraw Hill publications 2012. Microcontrollers(Architecture, Programming, Interfacing and System Design-2nd Edition) – Raj kamal, Pearson Publication 2012.

SEMESTER-VI	L	T	P	C
	3	-	-	3
16EC6T03 : VLSI SYSTEM DESIGN				

COURSE OUTCOMES:

Students are able to

CO1. Describe the design issues, design trends and testability of VLSI circuits using simulation and synthesis software tools.

CO2. Explain the fabrication process, layout design of logic circuits and Electrical properties of MOS Circuits

CO3. Analyze the CMOS circuit design processes and scaling of MOS circuits

CO4. Summarize the use of different programmable logic devices.

UNIT I

DIGITAL DESING USING HDL:

Introduction to HDL and History of VHDL, VHDL requirements, VLSI Design flow and Circuit design process, Hardware simulation and Synthesis, Levels of abstraction. Elements of VHDL, Packages, Libraries and Bindings, Objects and classes, Variable assignments and Sequential statements. Usage of subprograms, Comparison of VHDL and Verilog HDL.

UNIT II

INTRODUCTION TO MOS TRANSISTOR:

IC Technology and its Era. MOS and related VLSI Technology, Basic MOS Transistor operations like Enhancement and Depletion modes. MOS, CMOS and Bi-CMOS fabrication processes, Comparison between CMOS and Bipolar technologies.

UNIT III

BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS:

Ids-Vds relationships, Aspects of MOS transistor Threshold Voltage, Trans-conductance, Output Conductance and Figure of Merit, The pass transistor and NMOS Inverter. Determination of pull-up to pull-down Ratio of NMOS Inverter driven by another NMOS inverter and driven through one or more pass transistors. Alternative forms of pull-up, CMOS Inverter, Bi-CMOS Inverter, Latch-up in CMOS circuits and Bi-CMOS Latch-up Susceptibility and MOS transistor circuit model.

UNIT-IV

MOS and Bi - CMOS CIRCUIT DESIGN PROCESSES:

MOS Layers, Stick Diagrams, Design Rules (Lambda) and Layouts, Sheet Resistance, and its concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, and some examples of its calculations. The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation delays, Wiring capacitances and Choice of layers.

UNIT-V

SCALING OF MOS CIRCUITS:

Overview on effect of Scaling on different Device Parameters and its limitations. Introduction to Switch Logic, Gate Logic and Complex logic gates.

UNIT-VI

SEMICONDUCTOR INTEGRATED CIRCUIT DESIGN:

Introduction to architectures of PLD's like PROM, Programmable Logic Array (PLA), Programmable Array logic (PAL), FPGA's and CPLD's. Implementation approaches in VLSI Design using Full,Semi -Custom,, GATE Arrays.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, and Sholeh Eshraghian, PHI, 2005 Edition. .**(UNIT-II,III,IV,V,VI)**
2. VHDL Primer - J.Bhaskar , Prentice Hall Of India Publications. **(UNIT-II)**
3. VLSI Design – Black Book By Dr.K.V.K.K.Prasad, Kattula Shyamala, Kogent Learning Solutions Inc.2012 Edition. **(UNIT-VI)**

REFERENCES:

1 VLSI Designing - K.Lal Kishore and V.S.V.Prabhakar, I.K.International Publishing House Private Limited, 2009 First Edition.
2 VLSI Design - A.Albert Raj & T.Latha, PHI Learing Private Limited, 2010.

SEMESTER-VI	L	T	P	C
	3	-	-	3
ELECTIVE - II 16EC6E01: ANALOG AND DIGITAL IC DESIGN				

COURSE OUTCOMES:

Students are able to

CO1: Describe the different MOS devices and modeling.

CO2: Explain various voltage references & current sources, including Band gap voltage, proportional to absolute temperature (PTAT) current source.

CO3: Develop CMOS inverters and amplifiers.

CO4: Design Combinational & Sequential MOS logic circuits.

UNIT-I

MOS DEVICES AND MODELING:

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Sub-threshold MOS Model.

UNIT-II

ANALOG CMOS SUB-CIRCUITS:

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-III

CMOS AMPLIFIERS:

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers and its architectures.

UNIT-IV

MOS DESIGN:

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-V

COMBINATIONAL MOS LOGIC CIRCUITS:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT –VI

SEQUENTIAL MOS LOGIC CIRCUITS:

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

TEXT BOOKS:

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013**(UNIT - I,II,III)**
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011. **(UNIT - IV,V.VI)**
3. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010. **(UNIT - I,II,III)**

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

SEMESTER-VI	L	T	P	C
	3	-	-	3
ELECTIVE - II **16CS6E05: DATA STRUCTURES**				

COURSE OUTCOMES

Students are able to

CO1. Illustrate single, circular and double linked list.

CO2. Analyze stacks and queues using arrays and linked lists.

CO3. Explain various operations on binary trees.

CO4. Apply appropriate sorting and searching techniques for the given data.

CO5. Analyze various concepts in binary tree

CO6. Illustrate various operations on Graphs.

UNIT – I

Introduction- Concept of data structures, Overview of data structures, implementation of data structures. Searching: Linear Search, Binary Search, Fibonacci search. Sorting (Internal): Basic concepts, Sorting by: insertion (Insertion sort), selection (selection sort), exchange (Bubble sort, quick sort), distribution (radix sort) and merging (merge sort).

UNIT – II

Stacks Representation using Arrays and Linked List, operations on stack, factorial calculation, evaluation of arithmetic expression.

UNIT – III

Queues Representation using Arrays and Linked List, operations on queue, circular queue, queue using stack.

UNIT – IV

Linked lists: Linked Lists- Single linked list, Circular linked list, Double linked list, Circular double linked list.

UNIT – V

Trees Binary Trees: Basic tree concepts, Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, threaded binary tree. Binary search trees: Basic concepts, BST operations: Search, insertion, deletion and traversals, Creation of binary search tree from in-order and pre (post)order traversals.

UNIT – VI

Graphs Basic concepts, representations of graphs, operations on graphs- vertex insertion, vertex deletion, find vertex, edge addition, edge deletion, graph traversals (BFS & DFS)(No Programs required)

TEXT BOOKS:

1. Richard F, Gilberg ,Forouzan, Data Structures, 2nd edition, , Cengage.
2. Debasissamanta, Classic Data Structures, PHI, 2 nd edition, 2011.

REFERENCE BOOKS:

1. Seymour Lipschutz, Data Structure with C, TMH.
2. G. A. V. Pai, Data Structures and Algorithms, TMH, 2008.

SEMESTER-VI	L	T	P	C
	3	-	-	3
ELECTIVE - II **16EC6E02: SATELLITE COMMUNICATIONS**				

COURSE OUTCOMES:

Students are able to.

CO1 : Describe the historical back ground of satellite communications and apply the knowledge to locate satellite in the orbit and assess the orbital effects in satellite communications.

CO2 : Explain the functioning of AOCS,TTC and other satellite Sub-Systems.

CO3 : Demonstrate link budget calculations, understand the design and working of multiple access techniques and earth station technology.

CO4 : Develop and comprehend audio / video lectures related to various satellites launched in Space due to technological change.

UNIT-I

INTRODUCTION:

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

UNIT-II

ORBITAL MECHANICS AND LAUNCHERS:

Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT-III

SATELLITE SUBSYSTEMS: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antenna Equipment Reliability and Space Qualification.

UNIT-IV

SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT-V

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermediation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread spectrum transmission and reception.

UNIT-VI

EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods. low earth orbit and geo-stationary satellite systems: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt 2nd Wiley Edition 2003 **(UNIT - I,II,III,IV & VI)**
2. Satellite Communication - D.C Agarwal. Khanna Publications 5th Edition **(UNIT - V)**

REFERENCES :

1. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud. 2nd Edition Pearson Publications,2003.
2. Fundamentals of Satellite Communications – K.N. Raja Rao,PHI 2004

SEMESTER-VI	L	T	P	C
	3	-	-	3
ELECTIVE - II **16EC6E03: TELEVISION ENGINEERING**				

COURSE OUTCOMES:

Students are able to

CO1. Define and Describe the basic concepts of Television Engineering and TV signal transmission.

CO2. Illustrate the operation of TV cameras and picture tubes for monochrome TV.

CO3. Distinguish between monochrome & colour television transmitters and receivers.

CO4. Analyze and evaluate the NTSC and PAL colour systems.

UNIT- I

INTRODUCTION :

TV transmitter and receivers, synchronization. Television Pictures: Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal: Horizontal and vertical sync, scanning sequence. Colour signal generation and Encoding: Perception of brightness and colours, additive colour mixing, video signals for colours, luminance signal, colour difference signals, encoding of colour difference signals, formation of chrominance signals, PAL encoder.

UNIT-II

TV SIGNAL TRANSMISSION AND PROPAGATION :

Picture signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW, TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

UNIT-III

TV CAMERAS & PICTURE TUBES :

Camera tube types, Vidicon, Silicon Diode Array Vidicon, Monochrome TV camera, color camera. CCD Image Sensors. Monochromatic Picture tube, Electrostatic focussing, Beam deflection, picture tube characteristics and specifications, colour picture tubes.

UNIT-IV

MONOCHROME TV RECEIVER :

RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits. PAL-D Colour Receiver: Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Colour Phasors, synchronous demodulators, Subcarrier generation, raster circuits.

UNIT-V

COLOUR SIGNAL DECODING :

PAL – D decoder, chroma signal amplifiers, separation of U and V signals, Color burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, RO phase shift and 180o PAL–SWITCH circuitry, U & V demodulators, Colour signal mixing.

UNIT-VI

SYNC SEPARATION, AFC AND DEFLECTION OSCILLATORS:

Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit. Deflection Oscillators, deflection drive Ics. Receiver Antennas. DIGITAL TV Digital Satellite TV, Direct to Home Satellite TV, Digital TV Receiver, Digital Terrestrial TV.

TEST BOOKS :

1. Modern Television Practice – Principles, Technology and Service – R.R. Gulati, New Age International Publication, 2002. **(UNIT - I,II,III &IV)**
2. Monochrome and Colour TV – R.R. Gulati, New Age International Publication, 2002. **(UNIT - V & VI)**

REFERENCES :

1. Colour Television Theory and Practice – S.P. Bali, TMH, 1994. 2. Basic Television and Video Systems – B. Grob and C.E. Herndon, McGraw Hill, 1999.

SEMESTER-VI	L	T	P	C
	-	-	4	2
16EC6L01: MICROPROCESSORS & MICROCONTROLLERS LAB				

COURSE OUTCOMES:

Students are able to

CO1. Demonstrate assembly language programs for various problems.

CO2. Develop the programs using Microcontroller 8051 for various applications.

CO3. Design microprocessor to external devices like keyboard, DAC, Stepper motor.

CO4. Analyze the Embedded C programs for simple applications.

PART-I: MICROPROCESSOR-8086 Programming

1. Verify Arithmetic Operations for Multi byte Addition and Subtraction using ALP.
2. Execute ALP for Multiplication and Division for signed and unsigned Arithmetic operations.
3. Develop assembly programs for different ASCII Arithmetic operation.
4. Explain how Logical operations are performed in Microprocessors with the help of TASM SOFTWARE.
5. Perform Convections of all BCD and ASCII operations using ALP.
6. Construct different programs for checking all String operations.
7. Apply DOS/BIOS programming for Reading data from keyboard.

PART-II: INTERFACING WITH 8086

1. Design an Interfacing circuit for DAC with 8086 μP to generate various waveforms using 8255.
2. Write a control word format for 8255 to interface stepper motor with 8086 μP using 8255.

PART-III: INTERFACING WITH MICROCONTROLLER

1. Write an Embedded C program to interface switches and LEDs/Seven Segment display.
2. Demonstrate different modes of Timers in 8051 μC.
3. Verify how Serial Communication Implemented in 8051 μC.

EQUIPMENT REQUIRED FOR LABORATORY

1. MASM/TASM software
2. 8086 Microprocessor Kits
3. D/A Interface
4. Stepper motor
5. 8051 Micro Controller kits
6. Keil Software

SEMESTER-VI	L	T	P	C
	-	-	4	2
16EC6L02: VLSI DESIGN LAB				

COURSE OUTCOMES:

Students are able to

CO1. Describe the fundamental concepts of hardware description language (HDL).

CO2. Design and simulate combinational and sequential digital circuits using Modelsim & Xilinx – VHDL language

CO3. Analyze the Read and Write operations of RAM and Arithmetic and Logical units.

CO4. Develop different logic gates and logic cells using micro wind tool.

Minimum Twelve Experiments 8 from Part-A and 4 from Part-B to be conducted:

PART-A

1. Develop VHDL Programs in different models for all logic gates.
2. Write the VHDL Programs for half adder and full adder.
3. Explain operation of both binary encoder and binary decoder using HDL programs.
4. Construct 32:1 multiplexer using 8:1 multiplexers and write VHDL program.
5. Implement (7, 4) Hamming code generator and develop VHDL program for it .
6. Verify the outputs for different input combinations in 4 bit comparator using VHDL program.
7. Simulate the operation of D- Flip-flop in behavioral model VHDL Program.
8. Design and develop HDL program for 3 bit Johnson counter.
9. Explain the operation of 4 bit counter using structural model VHDL Program.
10. Demonstrate PIPO Shift register operation using mixed model VHDL Program.
11. Universal shift register operation explanation using VHDL Program.
12. VHDL program for verifying different operations of 16*4 RAM .
13. Stack and Queue implementation using 16*4 RAM by VHDL Program.
14. Perform both Arithmetic and Logical operation using ALU and develop VHDL Program.

PART-B

1. Sketch the Layout of Invertor using Microwind tool.
2. Develop the Universal gates layout using Microwind tool.
3. Design XOR gate layout using Microwind tool.
4. Construct SRAM cell Layout using Microwind tool.
5. Draw the Layout of R-S Latch using Microwind tool.
6. D- flip-flop layout design using Microwind tool.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. XILINK SOFTWARE ISE TOOLS
2. CPLD & FPGA Trainer Kits
3. Microwind tool

SEMESTER-VI	L	T	P	C
	-	-	4	2
16BS6T01: SOFT SKILLS AND APTITUDE LAB				

- Total Number of Laboratory Sessions: 10
- Total Number of Modules: 4

List of Modules:

- **Module-I:** Communicative Grammar and Language Skills

i) Grammar: a) Parts of Speech
b) Articles and useful prepositions
c) Sentence and its types
d) Verb forms and Tenses
e) Question Tags
f) Do-Forms and Wh-questions
g) Common mistakes at proficiency

ii) Language Skills

a) Listening activity with a CD on Parts of Speech
b) Listening activity with a CD on Articles and Prepositions
c) Listening activity through CD on sentence and its types
d) Listening activity with a CD on Verb forms and Tenses
e) Reading activity on Question Tags
f) Reading activity on Do-Forms and Wh-questions
g) Writing activity (Resume)
h) Writing activity (E-mail)
i) Writing activity (Guided Composition)
j) Writing activity (Guided Composition)

- **Module-II:** Communication Skills
  a) JAM/J2M on a given topic
  b) Introduce yourself (Strengths and weaknesses)
  c) Conversations
  d) Body Language
  e) Presentations
  f) Group Discussion
  g) Interview Skills

- **Module-III:** Vocabulary
  a) 20 useful vocabulary for an engineering resume
  b) Commonly confused words
  c) One-word Substitutes
  d) Useful phrases or expressions for a Telephonic Interview

e) Useful phrases or expressions for introduction and conclusion at a speech, interview, presentation, seminar, conference, GD etc.
f) GRE words
g) Useful phrases for an interview

- **Module-IV:** Soft Skills
  a) Positive Attitude- Courtesy and etiquette
  b) Motivation
  c) Adaptability
  d) Goal Setting
  e) Leadership Qualities
  f) Team Work
  g) Problem Solving
  h) Time and Stress Management
  i) Negotiation and conflict resolution
  j) Interpersonal Skills

- **Method/Approach to be Adopted:** Communicative, implicit, incidental and activity based method to create enthusiasm among the students.

Division of Syllabus for each Laboratory Session

Lab-I: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills

Grammar Topic: Parts of Speech

Language Skills Topic: Listening activity with a CD on Parts of Speech

Activity follows

Part-II: Communication Skills

Topic: JAM/J2M on a given topic

Part –III: Vocabulary

Topic: 20 useful vocabulary for an engineering resume

Part-IV: Soft Skills

Topic: Positive Attitude- Courtesy and etiquette

Lab-II: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills

Grammar Topic: Articles and useful prepositions

Language Skills Topic: Listening activity with a CD on Articles and Prepositions Follow-up Activity: Articles and Prepositions For E.g., Picture Description on Articles and Prepositions

Part-II: Communication Skills

Topic: Introduce yourself (Strengths and weaknesses)

Activity: Role Play/Simulation

Part –III: Vocabulary

Topic: Commonly confused words

Part-IV: Soft Skills

Topic: Motivation

Lab-IX: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills

Grammar Topic: Common mistakes at proficiency

Language Skills Topic: Writing (Guided Composition)

Part-II: Communication Skills

Topic: Group Discussion

Part –III: Vocabulary

Topic: Common mistakes at proficiency

Part-IV: Soft Skills

Topic: Negotiation and conflict resolution

Lab-X: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills

Grammar Topic: Common mistakes at proficiency

Language Skills Topic: Writing (Guided Composition)

Part-II: Communication Skills

Topic: Interview Skills

Part –III: Vocabulary

Topic: Common mistakes at proficiency

Part-IV: Soft Skills

Topic: Interpersonal Skills

APTITUDE LAB FOR VI SEM (40 HOURS)

TOPICS

APTITUDE		REASONING	
• PERCENTAGES	(3)	BLOOD RELATIONS	(2)
• RATIO AND PROPORTIONS	(3)	DIRECTIONS	(2)
• AVERAGES	(2)	SYLLOGISM	(2)
• TIME AND WORK	(2)	CODING AND DECODING	(2)
• PIPES AND CISTERNS	(1)	ANOLOGY	(2)
• PROFIT AND LOSS	(3)	CLASSIFICATION	(2)
• LCM & HCF	(3)	SERIES	(2)
• SIMPLE INTEREST	(2)		
• COMPOUND INTEREST	(3)		
• TIME AND DISTANCE	(2)		
• TRAINS ,BOATS & STREAMS	(2)		

SEMESTER-VII	L	T	P	C
	3	-	-	3
16EC7T01: MICROWAVE AND OPTICAL COMMUNICATIONS				

COURSE OUTCOMES:

Students are able to

CO1. Summarize about different types of modes in wave guides and how to decrease the transmission and power losses, different types of microwave solid state devices and their applications

CO2. Attain the knowledge about how these microwaves are generated transmitted, amplified and finally measured using Passive devices.

CO3. Describe the fundamentals, advantages ,Ray theory transmission in Optical Communication and effect of dispersion of the signal, types of fiber materials, different losses in fibers

CO4. Gain knowledge about Optical transmitters, receivers and estimation of link and power budget analysis**.**

UNIT-I

WAVEGUIDES:

Microwave Spectrum, Bands and Applications of Microwaves, Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular wave guide, Impossibility of TEM mode.

UNIT-II

MICROWAVE ACTIVE DEVICES:

Transferred Electron Devices: Gunn Diode-Principle, Two Valley Model Theory/RWH Theory, Characteristics and Modes of operation.

Avalanche Transit Time Devices: IMPATT and TRAPATT Diode-Principle of Operation and Characteristics, related expressions, Problems, Two Cavity Klystron Amplifier – Power and Efficiency considerations – Reflex Klystron Oscillators – Modes and Efficiency considerations – Magnetrons – TWT.

UNIT-III

MICROWAVE PASSIVE DEVICES:

Waveguide Corners, Bends, Twists, Scattering Parameters and Matrix, Scattering parameters of Wave Guide Tees: E-Plane, H-Plane, E & H Plane, Hybrid Rings (Rat-Race),Directional Coupler: Single hole and Multi hole, Fixed and Variable Attenuators, Ferrite Devices: Gyrator, Isolator and Circulator.

UNIT-IV

MICROWAVE MEASUREMENTS:

Description Microwave Bench, Different Blocks and their Features, Precautions, Frequency Meter, Slotted line section, Measurement of Attenuation, Frequency, Power, VSWR, Cavity Q and Impedance.

UNIT-V

OPTICAL FIBERS AND DEVICES:

Propagation of light - Optical fiber structures, Acceptance angle, Numerical aperture, Attenuation, Absorption losses - Scattering losses , Dispersion – Radiation losses. Splicing Technique, Optical Fiber connector, Connector types and single mode fiber connector.

UNIT VI

OPTICAL NETWORKS:

Optical Source - LED, ILD characteristics. Optical detectors – PIN and APD characteristics. Optical t transmitters and receivers, System block diagram - point to point link – link design, power budget analysis. WDM- DWDM.

TEXT BOOKS

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.**(UNITS-I&II)**.
2. Microwave and Radar Engineering- M.Kulkarni, Umesh Publications 4th Edition, 2010. **(UNITS-II,III&IV)**
3. Gerd Keiser, "Optical Fiber Communications", the McGraw Hill Companies, 4th Edition, 2008. **(UNITS-V&VI)**

REFERENCE BOOKS:

1. Annapurna Das, Sisir K Das, "Microwave Engineering", 2nd edition, 2006, Tata McGraw Hill.
2. John. M. Senior, "Optical Fiber Communications Principles and Practice", Second Edition, PHI, 1992.

SEMESTER-VII	L	T	P	C
	3	1	-	4
16EC7T02: DIGITAL SIGNAL PROCESSING				

COURSE OUTCOMES:

Students are able to

CO1: Analyze the Discrete system in Time and Frequency domain through its respective tools

CO2: Demonstrate about Fourier series, DFT and to solve the FFT using DIT & DIF algorithms

CO3: Apply Z-transform and Discrete Fourier transform to analyze a digital system.

CO4: Design IIR and FIR digital filters for various applications.

UNIT-I

INTRODUCTION:

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

UNIT-II

DFT and FFT:

Discrete Fourier transforms: Computation of DFT , Properties of DFT, linear and circular convolution of sequences using DFT, Overlap add method , Overlap- save method, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT-II

REALIZATION OF DIGITAL FILTERS:

Applications of Z-transforms, solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems, Realization of digital filters-Direct, canonic, cascade and parallel.

UNIT-IV

IIR DIGITAL FILTERS:

Analog filter approximations - Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations.

UNIT-V

FIR DIGITAL FILTERS:

Characteristics of FIR Digital Filters, frequency response Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT-VI

MULTIRATE DIGITAL SIGNAL PROCESSING:

Introduction,Downsampling,Decimati on,Upsampling,Interpolation,Sampling rate conversion, Conversion of band pass signals,

Concept of resampling, Applications of multi rate sampling.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson education/PHI. 2007. .**(UNITS-I,II&III)**.
2. Discrete time signal processing- A.V.Oppenhiem and R.W.Schaffer. PHI . **(UNITS-IV,V&VI)**.

REFERENCES:

1. Digital Signal Processing – Andreas Antoniou, TATA McGraw Hill, 2006
2. Digital Signal Processing – MH Hayes, Schaum's Outlines, TATA McGraw Hill, 2007

SEMESTER-VII	L	T	P	C
	3	-	-	3
16EC7T03: RADAR ENGINEERING				

COURSE OUTCOMES:

Students are able to

CO1. Describe the basic concepts of radar and analyze radar range equation.

CO2. Demonstrate the operation and applicability of CW radar**.**

CO3. Summarize the operation and applicability of MTI and tracking radar**.**

CO4. Illustrate the functioning of radar antennas and radar receivers with noise performance.

UNIT – I

BASICS OF RADAR SYSTEM:

Nature of Radar, Maximum Unambiguous Range. Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Related Problems. Radar Equation: Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets-sphere, cone-sphere). Transmitter power. PRF and Range Ambiguities, System Losses (Qualitative treatment). Related Problems**.**

UNIT-II

CW AND FM-CW RADAR:

Doppler effect, CW Radar -Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirement, Applications of CW radar. FMCW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

UNIT-III

MTI AND PULSE DOPPLER RADAR:

Introduction, Principle, MTIR Radar with Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers - Filter Characteristics, Blind Speeds, Double Cancellation staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler Radar.

UNIT-IV

TRACKING RADAR:

Tracking with Rader, Sequential Lobing, Conical Scan, Monopulse Tracking Rader, Amplitude comparison Monopulse (One and Two coordinates), Phase comparison monopulse, Tracking in range, Acquisition and scanning patterns, Comparison of trackers.

UNIT-V

DETECTION OF RADAR SIGNALS IN NOISE:

Introduction, Matched Filter Receiver -response Characteristics and Derivation, Correlation detection, Detection criteria, Detector characteristics, Automatic Detection, Constant False Alarm Rate Receiver.

UNIT-VI

RADAR ANTENNAS AND RADAR RECEIVER:

Electronically Steered Phased Array Antennas, Phase Shifters, Radiation for Phased Array, architecture for Phased Arrays. Radar Displays - types. Duplexer - Branch type and Balanced type. Radiation Pattern. Beam Steering and Beam Width changes, Series versus Parallel Feeds. Applications, Advantages and Limitations.

TEXT BOOKS:

1. Introduction to Radar Systems- Merrill I. Skolnik, 2nd Ed, McGraw Hill , 1981. **(UNIT- I,II,III, IV,V&VI)**

2. Radar Engineering and fundamentals of Navigational Aids-G.S.N.Raju, I.K International,2008. **(UNIT - I)**

REFERENCES:

1. Introduction to Radar Systems - Merrill I. Skolnik, 3rd Ed,Tata McGraw - Hill,2001.
2. Radar: Principles, Technologies, Applications- Byron Edde, Pearson Education.

SEMESTER-VII	L	T	P	C
	3	-	-	3
ELECTIVE - III **16EC7E01: MIXED SIGNAL DESIGN**				

COURSE OUTCOMES:

Students are able to

CO1.Describe the Fundamentals of Switched Capacitor Circuits

CO2.Design the various circuits (applications)by using Phase Locked Loop

CO3. Explain different types of data conversions in communications.

CO4. Apply continuous time filters for various MOS circuits.

UNIT – I

SWITCHED CAPACITOR CIRCUITS FUNDAMENTALS:

Introduction to Switched Capacitor circuits, basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters.

UNIT – II

PHASED LOCK LOOP (PLL):

Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP no idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT- III

D/A CONVERTER FUNDAMENTALS:

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters,Thermometer-code converters, Hybrid converters.

UNIT-IV

A/D CONVERTERS:

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT – V

OVERSAMPLING CONVERTERS:

Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A

UNIT –VI

CONTINUOUS-TIME FILTERS:

Introduction to Gm-C Filters, Bipolar Transconductors, CMOS trans-conductors Using Triode and Active Transistors, BiCMOS Tran conductors, MOSFET-C Filters.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002 **(UNITS - I, II, IV,V&VI)**
2. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edition, 2013 **(UNITS -I, II, III&V)**

REFERENCE BOOKS:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design ,Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

SEMESTER-VII	L	T	P	C
	3	-	-	3
ELECTIVE – III **16EC7E05: OOPS THROUGH JAVA**				

COURSE OUTCOMES:

Students are able to

CO1: Define the difference between procedural oriented programming and object oriented programming (OOP) paradigms, Java features, Apply OOP Concepts.

CO2: Apply the java control statements and String Class.

CO3: Apply the concept of Inheritance and polymorphism.

CO4: Apply the Packages and Interfaces.

CO5: Describe the Exception handling and Applets.

CO6: Analyze the concepts of Multithreading.

UNIT –I

INTRODUCTION TO JAVA:

History – Java features – Java Environment – JDK1.8 – API. - Types of java program – Creating and Executing a Java program – Java Tokens: Keywords, Character set, Identifiers, Literals, Separator – Java Virtual Machine (JVM) – Command Line Arguments – Comments in Java program. **Introduction to OOPS:** Paradigms of Programming Languages - Basic concepts of Object Oriented Programming – Differences between Procedure Oriented Programming and Object Oriented. Programming - Objects and Classes – Data abstraction and Encapsulation, Inheritance, Polymorphism – Benefits of OOP – Application of OOPs.

UNIT-II

JAVA BASICS:

Constants – Variables – Data types - Scope of variables – Type casting – Operators: Arithmetic - Logical – Bit wise operator – Increment and Decrement – Relational – Assignment –Conditional – Special operator – Expressions – Evaluation of Expressions.

Decision making and Branching: Simple if statement – if – else statement – Nesting if – else – else if Ladder – switch statement – Decision making and Looping: while loop – do – while loop - for loop – break — continue Statement. – Simple programs.

Arrays: One Dimensional Array – Creating an array – Array processing– Multidimensional Array.

Class and objects: Defining a class – Methods – Creating objects – Accessing class members – Constructors – Method overloading – Static members – Nesting of Methods – this keyword – Command line input – Simple programs.

Strings: String Array – String Methods – String Buffer and String Builder Class – Simple programs

UNIT- III

INHERITANCE AND ACCESS MODIFIERS: Defining a subclass – Deriving a sub class – Single Inheritance – Multilevel Inheritance –Hierarchical Inheritance – Overriding methods – Final Classes - Final variables and methods – Abstract methods and classes – super keyword - Visibility Control: public access, private access, protected.

UNIT- IV

INTERFACES AND PACKAGES: Multiple Inheritance - Defining interface – Extending interface - Implementing Interface - Accessing interface variables – Simple programs. Member access rules, super uses, using final with inheritance ,polymorphism, abstract classes. Java API Packages – System Packages – Naming Conventions – Creating & Accessing a Package – Adding Class to a Package – Hiding Classes – Programs.

UNIT- V

EXCEPTION HANDLING AND APPLETS: Limitations of Error handling – Advantages of Exception Handling - Types of Errors – Basics of Exception Handling - Exception Hierarchy – try blocks – throwing an exception – catching an exception – finally statement, built-in and user defined exceptions.

Applets: Introduction – Applet Life cycle – Creating & Executing an Applet.

UNIT VI

MULTITHREADING: Differences between multi-threading and multitasking, Creating Threads – Life Cycle of a Thread – Defining & Running Thread – Thread Methods – Thread Priority – Synchronization – Implementing runnable interface – Thread Scheduling.

TEXT BOOKS:

1. Java: The complete reference, 7/e, Herbert schildt, TMH.

2. Java: How to Program, 8/e, Dietal, Dietal, PHIE.Balaguruswamy: “Programming with Java A Primer”, 4th Edition, Tata McGraw Hill, 2009.

REFERENCE BOOKS:

1. Core JAVA, Black Book, NageswaraRao, Wiley, Dream Tech.
2. Programming in Java2, Dr K SomaSundaram, JAICO Publishing house.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

SEMESTER-VII	L	T	P	C
	3	-	-	3
16EC7E02: CELLULAR & MOBILE COMMUNICATIONS				

COURSE OUTCOMES:

Students are able to

CO1. Design Hexagonal shaped cells and how these are implemented in real world.

CO2. Explain different types of antenna systems in mobile communication.

CO3. Analyze Handoffs and different types of handoffs and Dropped call rates and their evaluation.

CO4. Describe applications of GSM Architecture and GSM channels, multiple access scheme, TDMA, CDMA.

UNIT-I

INTRODUCTION :

Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop(WLL), Wireless LANs, Bluetooth, Personal Area Networks(PANs),Examples of Wireless Communication Systems, A Simplified Reference Model, Applications.

UNIT-II

ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN :

General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

UNIT-III

THE CELLULAR CONCEPT :

Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co- Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring, Repeaters for Range extension, A microcell zone concept.

CELL SIZE ANTENNAS AND MOBILE ANTENNAS: Characteristics, Antennas at Cell site, Mobile Antennas.

UNIT-IV

MOBILE RADIO PROPAGATION :

Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

UNIT-V

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:

Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

UNIT- VI

DIGITAL CELLULAR NETWORKS:

GSM architecture, GSM channels, multiple access scheme, TDMA, CDMA.

TEXTBOOKS:

1. Mobile Cellular Communication by Gottapu Sasibhushana Rao, Pearson International, 2012.
   (UNIT - I, II, III &IV)
2. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
   (UNIT - V & VI)

REFERENCES:

1. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.
2. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

B. TECH SEMESTER-VII	L	T	P	C
	3	-	-	3
ELECTIVE - III **16EC7E03: EMBEDDED SYSTEMS**				

COURSE OUTCOMES:

Students are able to

CO1. Summarize the Embedded systems and its characteristics.

CO2. Describe the Embedded Hardware & Firmware requirements to design an embedded system.

CO3. Explain the Integration of Hardware and Firmware and testing of the design.

CO4. Analyze the real time and non-real time Embedded systems

UNIT-I

INTRODUCTION:

Embedded System-Definition, Embedded System versus General computing systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas of Embedded Systems, purpose of Embedded Systems, The typical Embedded System-core of the Embedded System, memory, sensors and actuators, communication interface, Embedded firmware, other system components, PCB and passive components.

UNIT-II

EMBEDDED SYSTEMS-CHARACTERISTICS AND QUALITY ATTRIBUTES:

Characteristics of Embedded System, quality attributes of Embedded System, Application -specific Embedded System-washing Machine, Domain-specific examples of Embedded System-Automotive.

UNIT-III

EMBEDDED HARDWARE DESIGN:

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timers and counting devices, Watchdog timer, Real time clock, VLSI and Integrated circuit design, EDA Tools, Or CAD EDA tool, The PCB Layout Design.

UNIT-IV

EMBEDDED FIRMWARE DESIGN:

Embedded firmware design approaches, embedded firmware development languages, ISR Concept, Interrupt sources, interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concept of C versus Embedded C and Complier versus Cross complier. The

main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interrupts Compliers and Linkers, Debugging tools,

UNIT-V

HARDWARE SOFTWARE CO-DESIGN AND TESTING:

Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade –offs, Integration of Hardware and Firmware, ICE, Issues in embedded system design. Quality assurance and testing of the design, testing on host machine, simulators, Laboratory Tools.

UNIT-VI

EMBEDDED SYSTEM DEVELOPMENT:

The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decomplier, Simulator, Emulator and Debugging, Target hardware debugging, Boundary Scan, Embedded system development process and tools.

TEXT BOOKS:

1. Embedded Systems, Raj Kamal-Tata McGraw Hill Education Private Limited, Second Edition, 2008**.(UNIT - I,II,III&IV)**

2. Introduction to Embedded Systems By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2009**.(UNIT - V & VI)**

REFERENCES:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications, 2005

2. Embedding system building blocks By Labrosse, CMP publishers.

SEMESTER-VII	L	T	P	C
	-	-	4	2
16EC7L01: MICROWAVE & OPITCAL COMMUNICATIONS LAB				

COURSE OUTCOMES:

Students are able to

CO1. Summarize about different types of modes in wave guides and characteristics

CO2. Interpret different types of components which are using in microwave communication.

CO3. Analyze the optical fiber components such as sources, detectors and amplifiers.

CO4. Explain the key features of optical fiber, and describe various types of optical fibres and coupling losses

LIST OF EXPERIMENTS:

PART – A (ANY 7 EXPERIMENTS):

1. To verify the Reflex Klystron Characteristics.
2. To examine the Gunn Diode Characteristics.
3. To measure the Attenuation in microwave tubes.
4. To study the Directional Coupler Characteristics.
5. To measure the Voltage Standing Wave Ratio.
6. To calculate the Impedance and Frequency of a unknown Microwave.
7. To measure the different Waveguide parameters.
8. To generate the Scattering parameters of Circulator.
9. To calculate the Scattering parameters of Magic Tee.

PART-B (ANY 5 EXPERIMENTS):

10. To explain the Characterization of LED.
11. To Verify the Characterization of Laser Diode.
12. Calculating Intensity modulation of Laser output through an optical fiber.
13. To Measure Data rate for Digital Optical link.
14. To Measure of Numerical Aperture of an unknown Optical Wave.
15. To Calculate the different losses in Analog Optical link.

ADDITIONAL EXPERIMENTS: (BEYOND SYLLABUS)

1. Measurement of Polar Pattern of Horn antenna.
2. Microwave Crystal Detector.
3. Study of Rise time and Fall time distortion in optical digital link.

OPEN ENDED EXPERIMENTS:

1. Observe double minimum method is better than direct VSWR meter for measuring high VSWR ratio's.
2. To observe scattering parameters of a Magic Tee when connected as a simple transmitter and receiver.
3. In the place of TE10 mode if TE01 is placed what will be the output power in the tuned Microwave bench setup.

B. TECH SEMESTER-VII	L	T	P	C
	-	-	4	2
16EC7L02: DIGITAL SIGNAL PROCESSING LAB				

COURSE OUTCOMES:

Students are able to

CO1. Apply the basics of MATLAB and C-languages for the development of various DSP applications.

CO2. Analyze the various applications by transforming the input sequence using FFT algorithm.

CO3. Design IIR and FIR digital filters and use them in different applications.

CO4. Develop various real time applications using digital signal processor such as TMS3206713.

LIST OF EXPERIMENTS

1. Introduction To Matlab
2. To Generate Basic Discrete-Time Sequences
3. To Compute FFT and IFFT
4. To find the Sum of Sinusoidal Signals
5. To find the Response of LTI Discrete-Time System
6. To find the Frequency Response of LTI Discrete-Time System
7. To design FIR Filter Using Window techniques
8. To implement Butterworth and Chebyshev IIR Filters
9. To Study the architecture of DSP chips-TMS 320C 5X/6X Instructions.
10. To verify Linear Convolution
11. To verify Circular Convolution
12. To compute Power Density Spectrum sequence

OPEN ENDED EXPERIMENTS:

1. To Generate DTMF Signal
2. To Implement the Decimation Process.
3. To Implement the Interpolation Process.
4. To Implement the I/D Sampling Rate Converters.

SEMESTER-VII	L	T	P	C
	-	-	4	2
16EC7LE1: ADVANCED COMMUNICATION ENGINEERING LAB				

COURSE OUTCOMES:

Students are able to

CO1: Define different types modulation and demodulation schemes

CO2: Analyze different types of synchronization techniques

CO3: Describe different digital modulation techniques.

CO4: Describe OFDM and CDMA in mobile communication system.

Minimum 10 Experiments to be done (Hardware & Software)

1. Performance evaluation of digital modulation schemes
2. Pulse shaping , Timing & Frequency Synchronization
3. BPSK modulation and Demodulation
4. Differential BPSK modulation and Demodulation
5. 16 - QAM modulation and Demodulation
6. Decision Feedback Equalizer
7. OFDM -Synchronization & Channel Estimation
8. Channel Equalizer design (LMS , RLS)
9. Performance evaluation of simulated CDMA System
10. OFDM Transceiver design
11. Error correcting coding in CDMA Mobile communication system
12. Program to verify Decimation and Interpolation of a given sequence

Additional Experiments

1. Estimation of Power Spectrum Using Bartlett and Welch methods
2. Verification of Auto Correlation Theorem

Softwares Required :

1. Computer systems with latest specifications
2. Connected in LAN (Optional)
3. Operating System (Windows XP)
4. Simulation Software (MATLAB 2017a-Simulink)
5. SDR Board

SEMESTER-VII	L	T	P	C
	-	-	4	2
16EC7LE2: ROBOTICS LAB				

COURSE OUTCOMES:

Students are able to

CO1: Demonstrate the various basic Principles about building and functioning of Robot

CO2: Explain about different Programming concepts for robotic movements

CO3: Apply the ROBOTS for various detections in common world.

CO4: Develop different robots which are depending on required applications

Minimum Ten Experiments to be conducted:

1. To develop hand movement of ROBOT
2. To examine Leg movement of ROBOT
3. To design different face movements of ROBOT
4. To Perform forward & reverse movement of ROBOT
5. To generate circular movement in ROBOT
6. To Develop an automatic turn left and turn right ROBOT
7. To design Obstacle detecting ROBOT
8. To Develop Fire Detecting ROBOT
9. To construct GAS Detecting ROBOT
10. Perform Path movement ROBOT using BLUETOOTH Technology,
11. To Develop Signal based ROBOT
12. To Design Audio based ROBOT

ADDITIONAL EXPERIMENTS

1. Design of Coconut tree climbing ROBOT.
2. Develop Planting ROBOT.
3. Build Farming ROBOT.

EQUIPMENT REQUIRED

1. Aurdino board
2. Stepper motors
3. Metal strips
4. Pro-E Software
5. 8052 microcontroller boards
6. Sensors (Gas,Temperature, U.V)

SEMESTER-VII	L	T	P	C
	-	-	4	2
16CS7LE5: JAVA PROGRAMMING LAB				

COURSE OUTCOMES:

Students are able to

CO1: Apply solutions for a range of problems using object-oriented programming.

CO2: Develop Java programs that solve simple business applications.

CO3: Develop Java programs using String and String Buffer Class

CO4: Develop Java programs that implement concept of various types of inheritance.

CO5: Design Java programs using packages and interfaces.

CO6: Verify Exception Handling in java.

Note: Use JDK 1.7 or above on any platform.

LIST OF EXPERIMENTS

1. Installation of JDK, setting CLASSPATH and executing simple java program.
2. Write a Java Program to define a class, describe its constructor, overload the Constructors and instantiate its object.
3. Write a Java Program to define a class, define instance methods for setting and retrieving values of instance variables and instantiate its object.
4. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation.
5. Write a Java Program to demonstrate use of sub class.
6. Write a Java Program to implement array of objects.
7. Write a Java program to practice using String class and its methods.
8. Write a Java program to practice using String Buffer class and its methods.
9. Write a Java Program to implement inheritance and demonstrate use of method overriding.
10. Write a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods.
11. Write a program to demonstrate use of implementing interfaces.
12. Write a Java program to implement the concept of importing classes from user defined package and creating packages.
13. Write a program to implement the concept of Exception Handling using predefined exception.
14. Write a program to implement the concept of Exception Handling by creating user defined exceptions.

SEMESTER-VII	L	T	P	C
	-	-	4	2
16EC7LE3: RADIO AND TELEVISION ENGINEERING LAB				

COURSE OUTCOMES:

Students are able to:

CO1: Demonstrate hands-on practice on Radio and TV to study normal operation and fault diagnosis.

CO2: Explain the working of B/W and Color TV with the help of block diagram.

CO3: Summarize the components of B/W and Color TV.

CO4: Explain the working of DTH and Set Top Box

LIST OF EXPERIMENTS

1. To Study and analyze the SMPS Power supply stage
2. To Study and analyze the R.F. Turn stage
3. To Study and analyze the IF , VIF & Chromo color stage
4. To Study and analyze the Video output stage
5. To Study and analyze the Horizontal output state (LOT or EHT)
6. To Study and analyze the Vertical output stage
7. To Study and analyze the Picture tube(Color TV)
8. To Study and analyze the Yoke assembling (Vertical & Horizontal)
9. To Study and analyze the Audio out put stage & Speaker
10. To Study and analyze the Trouble shooting of Color TV
11. To Study and analyze the Audio Player
12. To Study and analyze the FM Radio

ADDITIONAL EXPEREMENTS

1. To Study and analyze the Voltage and Waveform analysis for Color TV
2. Study of Public Address (PA) System
3. Study of Direct To Home TV and Set-top box
4. Study of Digital TV (LED AND LCD)

EQUIPMENT REQUIRED

1. CRO
2. Digital Millimeter
3. Television Trainer Kit (Color)
4. Audio Amplifier Kit with speakers

SEMESTER-VIII	L	T	P	C
	3	-	-	3
ELECTIVE - IV **16EC8E01: SYSTEM ON CHIP**				

COURSE OUTCOMES:

Students are able to

CO1. Develop an idea about System Architecture and its components.

CO2. Analyze different Processor Architectures for different applications.

CO3. Explain the various Memories in the Memory design for SOC.

CO4. Design an SOC for different Applications.

UNIT-I

INTRODUCTION TO THE SYSTEM ARCHITECTURE:

System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

UNIT-II

PROCESSORS & INSTRUCTIONS:

Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III

MEMORY DESIGN FOR SOC:

Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System.

UNIT-IV

INTERCONNECT CUSTOMIZATION AND CONFIGURATION:

Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time.

UNIT-V

INTERCONNECT CONFIGURATION:

Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration – overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT-VI

APPLICATION STUDIES / CASE STUDIES:

SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

1. Computer System Design System-on-Chip – Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.**(Unit-I,II,III,IV,V,VI)**
2. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer **(Unit-II,III,V)**

REFERENCE BOOKS:

1. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.
2. System on Chip Verification – Methodologies and Techniques – Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

SEMESTER-VIII	L	T	P	C
	3	-	-	3
ELECTIVE - IV 16CS8E05: SOFTWARE ENGINEERING				

COURSE OUTCOMES:

Students are able to

CO1. Describe software development lifecycle phases.

CO2. Analyze and specify software requirements with various stakeholders of a software development project.

CO3. Explain about requirements in engineering process.

CO4. Demonstrate impact of potential solutions to software engineering problems using the knowledge of models, tools, and techniques.

CO5. Explain various testing strategies and debugging process.

CO6. Analyze various software quality management and concepts.

UNIT- I

INTRODUCTION TO SOFTWARE ENGINEERING:

The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), process assessment.

UNIT- II

PROCESS MODELS:

The waterfall model, Incremental process models, Evolutionary process models, The Unified process. **Software Requirements**: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

UNIT-III

REQUIREMENTS IN ENGINEERING PROCESS:

Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

UNIT-IV

DESIGN ENGINEERING:

Design process and Design quality, Design concepts, the design model. Software architecture, Architectural styles and patterns

UNIT-V

PERFORMING USER INTERFACE DESIGN:

Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation. Quality Management : Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

UNIT-VI

TESTING STRATEGIES:

A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging. Metrics for Process and Products: Software Measurement, Metrics for software quality.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 7th edition, McGraw-Hill International Edition.
2. Software Engineering-Sommerville, 7th edition, Pearson education.

REFERENCES:

1. Software Engineering- K.K.Agarwal &Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.

SEMESTER-VIII	L	T	P	C
	3	-	-	3
ELECTIVE – IV **16EC8E02: EMI/EMC**				

COURSE OUTCOMES:

Students are able to

CO1: Describe the effects of Electromagnetic Interferences from various Electronic Systems.

CO2: Explain the Electromagnetic Interference and design the Electronic Systems without Interference.

CO3: Analyze various Electromagnetic compatibility problems and able to improve the system performances by choosing the right type of filters

CO4: Define the various National/International EMC standards in different countries.

UNIT-I

NATURAL AND NUCLEAR SOURCES OF EMI/ EMC:

Introduction, Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations. An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT-II

EMI FROM APPARATUS, CIRCUITS AND OPEN AREA TEST SITES:

Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive inter modulation, cross talk in transmission lines, transients in power supply lines, electromagnetic interference (EMI), Open area test sites and measurements.

UNIT-III

RADIATED AND CONDUCTED INTERFERENCE MEASUREMENTS:

Anechoic chamber, TEM cell, GH TEM cell, characterization of conduction currents / voltages, conducted EM noise in power lines, conducted EMI from equipments, Immunity to conducted EMI detectors and measurements.

UNIT-IV

ESD, GROUNDING, SHIELDING, BONDING AND EMI FILTERS:

Principles and types of groundings, shielding and bonding, characterization of filters, power line filter designed, ESD, Electrical fast transients / bursts, electrical surges.

UNIT-V

CABLES, CONNECTORS, COMPONENTS:

Introduction, EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, opto- isolators, Transient and Surge Suppression devices.

UNIT-VI

EMC STANDARDS – NATIONAL / INTERNATIONAL:

Introduction, Standards for EMI and EMC, MIL-standards, IEEE/ANSI standards, CISPR/IEC standards, FCC regulations, Euro norms, British standards, EMI / EMC standards in Japan, conclusions.

TEXTBOOKS :

1. Engineering Electromagnetic Compatibility by Dr. V.P. Kodali, IEEE Publication, Printed in India by S. Chand & co. Ltd., New Delhi, 2000. **(Unit-I,II,III,IV,V,VI)**
2. Electromagnetic Interference and Compatibility IMPACT series, IIT - Delhi, Modules 1-9. **(Unit-I,III,V)**

REFERENCES :

1. Introduction to Electromagnetic Compatibility, NY, John Wiley, 1992, By C.R. Pal.

SEMESTER-VIII	L	T	P	C
	3	-	-	3
ELECTIVE – IV **16EC8E03: DIGITAL IMAGE PROCESSING**				

COURSE OUTCOMES:

Students are able to

CO1. Define basic concepts of image processing and image geometry.

CO2. Apply various operations on image both in spatial and frequency domains to solve various real time problems by converting them between domains.

CO3. Differentiate different types of images, such as black & white, grayscale and color images, and can convert image from one color model to other.

CO4. Analyze different features of the images for the purpose of Compression, authentication and safety.

UNIT-I

BASICS OF DIGITAL IMAGE PROCESSING :

Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels.

UNIT-II

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING:

Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters Filtering in the frequency domain: Preliminary concepts, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing and sharpening using frequency domain filters.

UNIT-III

IMAGE RESTORATION AND RECONSTRUCTION:

A model of the image degradation Restoration process, Noise models, restoration in the presence of noise only- Spatial Filtering - Mean filters, order statistic filters and adaptive filters.

UNIT-IV

COLOR IMAGE PROCESSING:

color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

UNIT-V

MULTI-RESOLUTION PROCESSING AND IMAGE COMPRESSION:

image pyramids, sub-band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimension. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets. Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking.

UNIT-VI

MORPHOLOGICAL IMAGE PROCESSING AND SEGMENTATION:

preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, Image segmentation- Fundamentals, point, line, edge detection thresholding, region -based segmentation. .

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, "Digital Image Processing, 3rd edition", Prentice Hall, 2008.**(UNITS - I,II,III&IV)**
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, "Digital Image Processing", Tata McGraw-Hill Education, 2011. **(UNITS – V&VI)**

REFERENCES:

1. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , "Digital Image Processing Using MATLAB" 2nd edition, Prentice Hall, 2009.
2. Fundamentals of Digital Image processing – A.K.Jain , PHI

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16CEXO01: GREEN BUILDINGS AND INFRASTRUCTURE**				

COURSE OUTCOMES:

Students are able to

CO1. Recognize existing energy codes, green building codes and green rating systems.

CO2. Compare cost and performance of building materials with recycled components.

CO3. List out construction materials and methods that more easily allow for salvage and re-use of building materials.

CO4. List out available renewable energy resources.

CO5. Develop the techniques and benefits of building performance testing, monitoring and metering.

CO6. Identify techniques for weatherization and sustainable remodeling of existing structures.

UNIT – I

GREEN BUILDINGS:

Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings- Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage.

UNIT - II

ENVIRONMENTALLY FRIENDLY BUILDING MATERIALS AND TECHNOLOGIES:

Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, Ferro-cement and Ferro-concrete.

UNIT - III

ENERGY AND RESOURCE CONSERVATION:

Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings-water harvesting in buildings.

UNIT - IV

USE OF RENEWABLE ENERGY RESOURCES:

Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar appliances, success case studies of fully solar energy based buildings in India.

UNIT – V

CLIMATE DESIGN:

Local climatic conditions-temperature, humidity, wind speed and direction-impact of climate change on built environment - comforts: the desirable conditions - Principles of thermal design - means of thermal -light and lighting-building acoustics- energy efficient lighting, Ventilation and air quality requirement, various techniques for passive cooling, case studies for passive cooling and thermal comfort.

UNIT - VI

GREEN BUILDING RATING SYSTEMS:

Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment - Modular wastewater treatment systems for built environment.

TEXT BOOKS:

1. "Alternative building materials and technologies" by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, New age international publishers, New Delhi.

2. "Non-Conventional Energy Resources" by G. D. Rai, Khanna Publishers.

REFERENCES:

1. Kibert, C. (2005) Sustainable Construction: Green Building Design and Delivery (Hoboken, NJ: John Wiley & Sons).

2. McDonough, W. and M. Braungart (2002) Cradle to Cradle: Remaking the Way We Make Things (New York: Farrar, Straus and Giroux).

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16CEXO02: DISASTER MANAGEMENT**				

COURSE OUTCOMES:

Students are able to

CO1. Identify the tools of integrating disaster management principles in disaster mitigation process.

CO2. Distinguish between the different approaches needed to manage pre and post- disaster activities.

CO3. Explain the process of risk management.

CO4. Recognize the 'relief system', 'disaster victim' and relate them.

CO5. Evaluate the planning strategies useful in risk mitigation processes.

CO6. Explain about public awareness and economic incentive possibilities.

UNIT-I

NATURAL HAZARDS AND DISASTER MANAGEMENT:

Introduction of DM – Inter Disciplinary -nature of the subject- Disaster Management cycle- Five priorities for action. Case study methods of the following: floods, draughts -Earthquakes- global warming, cyclones & Tsunamis- Post Tsunami hazards along the Indian coast - landslides.

UNIT-II

MAN MADE DISASTER AND THEIR MANAGEMENT ALONG WITH CASE STUDY METHODS OF THE FOLLOWING: Fire hazards - transport hazard dynamics -Solid waste management- post disaster – bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

UNIT-III

RISK AND VULNERABILITY:

Building codes and land use planning - social vulnerability - environmental vulnerability - Macroeconomic management and sustainable development, climate change risk rendition - financial management of disaster - related losses.

UNIT-IV

ROLE OF TECHNOLOGY IN DISASTER MANAGEMENTS:

Disaster management for infra structures, taxonomy of infrastructure - treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes -flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training transformable indigenous knowledge in disaster reduction.

UNIT-V

EDUCATION AND COMMUNITY PREPAREDNESS:

Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

UNIT-VI

MULTI-SECTIONAL ISSUES:

Impact of disaster on poverty and deprivation-Climate change adaptation and human health - Exposure , health hazards and environmental risk-Forest management and disaster risk reduction.-Institutional capacity in disaster management -The Red cross and red crescent movement.- Corporate sector and disaster risk reduction-A community focused approach.

TEXTBOOKS:

1. 'Disaster Management - Global Challenges and Local Solutions' by Rajib shah & R. Krishnamurthy (2009), Universities press.

2. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

3. 'Disaster Management - Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1. **'**Disaster Management' edited by H K Gupta (2003), Universities press.

2. "Disaster Management and Mitigation" by Prof. R.B. Singh (2016), World Focus

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16EEXO01: ELECTRICAL SAFETY MANAGEMENT**				

COURSE OUTCOMES:

Students are able to

1. Explain the objectives and precautions of Electrical safety, effects of shocks and their prevention.
2. Summarize the safety aspects during installation of plant and equipment.
3. Describe the electrical safety in residential, commercial and agricultural installations.
4. Describe the various Electrical safety in hazardous areas, Equipment earthing and system neutral earthing.
5. State the electrical systems safety management and IE rules.

UNIT-I

INTRODUCTION TO ELECTRICAL SAFETY, SHOCKS AND THEIR PREVENTION: Terms and definitions- objectives of safety and security measures- Hazards associated with electric current, and voltage who is exposed, principles of electrical safety- Approaches to prevent Accidents- scope of subject electrical safety. Primary and secondary electrical shocks -possibilities of getting electrical shock and its severity- medical analysis of electric shocks and its effects - shocks due to flash/ Spark over's - prevention and safety precautions against contact shocks - flash shocks, burns, residential buildings and shops.

UNIT-II

SAFETY DURING INSTALLATION OF PLANT AND EQUIPMENT: Introduction, preliminary preparations, preconditions during installation electrical plant and equipment, safety aspects. Field quality and safety during erection, personal protective equipment installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT-III

ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS Wiring and fitting – Domestic appliances – shock from wet wall and water taps – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT-IV

ELECTRICAL SAFETY IN HAZARDOUS AREAS :

Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations Classification of equipment provided for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

UNIT-V

EQUIPMENT EARTHING AND SYSTEM NEUTRAL EARTHING : Introduction description of earth system between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, neutral grounding(System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

UNIT-VI

SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS: Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees towards safety.

TEXT BOOKS:

5. S. Rao, Prof. H.L. Saluja, "Electrical safety, fire safety Engineering and safety management", Khanna Publishers. New Delhi, 1988.(units-I to V)

REFERENCE BOOK:

1. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997.

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16EEXO02: NON CONVENTIONAL ENERGY SOURCES**				

COURSE OUTCOMES:

Students are able to

CO-1. Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface.

CO-2. Design solar thermal collections.

CO-3. Design solar photo voltaic systems.

CO-4. Develop maximum power point techniques in solar PV and wind.

CO-5. Explain wind energy conversion systems, Betz coefficient , tip speed ratio.

CO-6. Explain basic principle and working of hydro, tidal, biomass ,fuel cell and geothermal systems.

UNIT–I

FUNDAMENTALS OF ENERGY SYSTEMS :

Energy conservation principle – Energy scenario (world and India) – Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

UNIT–II

SOLAR THERMAL SYSTEMS:

Liquid flat plate collections: Performance analysis – Transmissivity –Absorptivity – Product collector efficiency factor – Collector heat removal factor – Numerical problems – Introduction to solar air heaters – Concentrating collectors and solar pond.

UNIT–III

SOLAR PHOTOVOLTAIC SYSTEMS :

Balance of systems – IV characteristics – System design: Storage sizing, PV system sizing, Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique.

UNIT–III

WIND ENERGY:

Wind patterns – Types of turbines – Kinetic energy of wind – Betz coefficient – Tip–speed ratio – efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking.

UNIT–V

HYDRO AND TIDAL POWER SYSTEMS:

Basic working principle – Classification of hydro systems: large, small, micro – Measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Numerical problems – Wave power – Basics – Kinetic energy equation.

UNIT–VI

BIOMASS, FUEL CELLS AND GEOTHERMAL SYSTEMS:

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing.

- **Fuel cell:** classification – Efficiency – VI characteristics.
- **Geothermal**: classification – Dry rock and acquifer – Energy analysis.

TEXT BOOKS

1.Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.

2.Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis.

3.Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford.

REFERENCE BOOKS

1.Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal,World scientific, Singapore.

2.Renewable Energy Technologies /Ramesh & Kumar /Narosa.

3.Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16MEXO01: COMPOSITE MATERIALS**				

COURSE OUTCOMES:

Student are able to

CO1: Summarize the basic terminology and advantages of composite materials.

CO2: Classify and analyze various types of laminates.

CO3: Analyze the mechanical behavior of composite material as well as summarize various manufacturing methods of Laminated Fiber Reinforced Composite Material.

CO4: Analyze the micromechanical behavior of composite material.

CO5: Analyze the macromechanical behavior of composite material.

CO6: Explain various applications of Composite material in detail.

UNIT – I

INTRODUCTION TO COMPOSITE MATERIALS:

Definitions: Composite material, Fiber, Matrix. Types of fibers and Raw Fiber Properties, Types of Matrix, Prepegs, Fillers and other Additives. Advantages of Composite Materials and Structures – Strength and Stiffness advantages, Cost advantages, Weight advantages, Applications

UNIT – II

ANALYSIS OF LAMINATED COMPOSITES:

Laminates, Basic Assumptions, Strain-Displacement Relationship, Stress-Strain Relationships, Equilibrium Equations, Laminate Stiffness, Determination of Lamina Stresses and Strains, Types of Laminate Configuration, Balanced Laminate, Anti-symmetric Laminate, Examples

UNIT – III

BASICS OF COMPOSITE MATERIALS:

Mechanical Behavior of Composite Materials - Lamina, Laminate: The basic building block of a composite material. Manufacturing of Laminated Fiber-Reinforced Composite Materials

UNIT – IV

MICRO MECHANICAL ANALYSIS OF COMPOSITE STRENGTH AND STIFFNESS:

Properties of typical composite materials, Volume and Weight Fractions, Longitudinal Strength and Stiffness. Transverse Modulus, In-plane shear Modulus, Poisson's ratio.

UNIT – V

ELASTIC PROPERTIES OF UNIDIRECTIONAL LAMINA:

Stress-strain relationships. Engineering Constants. Stress strain relations of a Thin Lamina. Examples

UNIT – VI

APPLICATIONS OF COMPOSITE MATERIALS:

Use of Composite materials in present world – Aeronautical Applications, Space applications, Automotive applications and commercial applications.

TEXT BOOKS:

1. Mechanics of Composite Materials - R M Jones / Taylor & Francis

2. Mechanics of Composite Materials and Structures - Madhujit Mukhopadhyay / Universities Press

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16MEX002: OPERATION RESEARCH**				

COURSE OUTCOMES:

Students are able to

CO1: Apply linear programming techniques to solve industrial optimization problems.

CO2: Solve transportation and assignment problems using operation research techniques.

CO3: Solve sequencing problems using operation research techniques.

CO4: Solve replacement problems for optimization.

CO5: Analyze game theory and apply them for optimization.

CO6: Analyze queuing theory and apply it for optimization and also analyze inventory models for various industrial problems.

UNIT-I

LINEAR PROGRAMMING:

Linear programming problem formulation – Graphical solution – simplex method- artificial variables techniques -two–phase method, Big-M method – Duality principle.

UNIT- II

TRANSPORTATION PROBLEM:

Formulation – optimal solution, unbalanced transportation problem – Degeneracy, **ASSIGNMENT PROBLEM-** Formulation – optimal solution - variants of assignment problem- traveling salesman problem.

UNIT -III

SEQUENCING PROBLEM:

Introduction – Optimal Solution for processing n jobs through two machines- processing n jobs through three machines - processing n jobs through m machines - processing two jobs through m machines

UNIT –IV

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT- V

THEORY OF GAMES:

Introduction – minimax (maxmin) – criterion and optimal strategy –solution of games with saddle points – rectangular games without saddle points – 2 x 2 games– dominance principle – m x 2 & 2 x n games -graphical method.

UNIT VI

WAITING LINES:

Introduction- Single channel-Possion arrivals-Exponential service times-with infinite population model (M/M/1:FIFO/∞/∞),inventory **:** Introduction – single item – deterministic models – purchase inventory models with one price break and multiple price breaks – shortages are not allowed .

TEXT BOOKS:

1. Operations Research / S.D.Sharma, Ramnath co, Meerut
2. Operations Research, P.K.Gupta, D.S.Hira, S.Chand

REFERENCE BOOKS:

1. Operations Research /A.M.Natarajan,P.Balasubramani, A. Tamilarasi/PearsonEducation.
2. Operations Research / R.Pannerselvam,PHI Publications.

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16ECXO01: INTRODUCTION TO NANO TECHNOLOGY AND ITS APPLICATIONS**				

COURSE OUTCOMES:

Students are able to

CO1. Define Nano materials and Nano Technology with properties

CO2. Explain Synthesis as Fabrication methods of Nano Technology

CO3. Demonstrate Characterization techniques of Nano Materials

CO4. Analyze carbon Nano technology and application of Nano technology.

UNIT-I

INTRODUCTION: History of nano science, definition of nano meter, nano materials, nano technology. Classification of nano materials.Crystal symmetries, crystal directions, crystal planes.Band structure.

UNIT-II

PROPERTIES OF MATERIALS: Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-III

SYNTHESIS & FABRICATIONMETHODS: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography.

UNIT-IV

CHARECTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

UNIT-V

CARBON NANO TECHNOLOGY: Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nanocrystalling diamond films, grapheme, applications of carbon nanotubes, carbon nanotubes for nanoelectronics devices.

UNIT-VI

NANO TECHNOLOGYAPPLICATIONS: Applications in material science, biology and medicine, surface science, energy and environment. Applications of nano structured thin fins, applications of quantum dots.

TEXT BOOKS:

1.Nano science and nano technology by M.S RamachandraRao, Shubra Singh, Wiley publishers.

(UNITS-I,II&III)

2.Fundamentals of nano electronics by George W Hanson Pearson publications, India 2008

(Unit- IV,V&VI)

REFERENCE BOOKS:

1.Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.

2.Principles of Nanotechnology by Phani Kumar, Scitech.

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16ECXO02: INTRODUCTION TO GLOBAL POSITIONING AND NAVITATION SATELLITE SYSTEMS**				

COURSE OUTCOMES:

Students are able to

CO1. Describe the principles of GNSS based positioning methods, the main components in a satellite navigation system and their functions**.**

CO2. Estimate and represent the GPS coordinate frames & GPS orbits..

CO3. Analyze the influence of different error sources on the positioning precision.

CO4. Describe examples of the role of GNSS, or GNSS based products and services, in sustainable development**.**

UNIT – I

Overview of GPS: Basic concept, system architecture, space segment, user segment, services of GPS, applications of GPS.

UNIT – II

GPS Signals: Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT – III

GPS coordinate frames, Time references: Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS time.

UNIT – IV

GPS orbits and satellite position determination: GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination.

UNIT – V

GPS Errors: GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

UNIT – VI

GPS Aided Geo-Augmented Navigation (GAGAN) architecture, Indian Regional Navigation Satellite System. GNSS augmentation, Wide Area Augmentation System (WAAS), applications

TEXT BOOKS :

1. G S RAO, Global Navigation Satellite Systems, McGraw-Hill publications, New Delhi, 2010 **(Unit-I,III,IV,V,VI)**

2.B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice', Springer – Wien, New York (2001). **(Unit-I,II,IV)**

REFERENCES:

1.James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software Approach', John Wiley & Sons, 2001.

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16CSXO01: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS**				

COURSE OUTCOMES: Student are able to

CO1. Identify the different issues involved in the design and implementation of a database system

CO2. Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.

CO3. Predict different concurrency control techniques while implementing real time applications

CO4. Solve real time database issues through SQL concepts

CO5. Organize the data from unstructured to structured using different normal forms

CO6. Justify various kinds of secondary storage devices to store data

UNIT-I

History of DBMS, File Systems vs DBMS, Advantages of DBMS, Describing and Storing Data in DBMS, Transaction Management, Structure of a DBMS, people who work with Databases, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

UNIT-II

Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

UNIT-III

Relational Model: Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

UNIT-IV

SQL and Integrity Constraint:

Basic SQL Query, Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, Logical Connectivity Operators, Joins and Types, introduction to Triggers.

UNIT-V

Relational Database Design: Functional Dependency, Different anamolies in designing a Database., Normalization using funtional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Nomalization using multi-valued depedencies, 4NF, 5NF

UNIT –VI

Internals of RDBMS : Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

TEXT BOOKS:

1. Database Management Systems- Raghurama Krishnan, Johannes Gehrke, Tata McGraw-Hill., 3rd Edition.

REFERENCE BOOKS:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, 5th edition.
2. Database Management Systems, Elmasri Navathe-5th Edition.

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16CSXO02: INTRODUCTION TO BIG DATA ANALYTICS**				

COURSE OUTCOMES

After the completion of the course the students are able to

CO1. Explain the basic concepts of Big Data

CO2.Access and Process Data on Distributed File System

CO3.Design and explain Hadoop architecture

CO4.Develop the Map Reduce application

CO5.Identify the various tools in Hadoop Ecosystem

CO6.Develop Big Data Solutions using Hadoop Eco System

UNIT-I

INTRODUCTION TO BIG DATA

Topics - What is Big Data and where it is produced? Rise of Big Data, Compare Hadoop vs traditional systems, Limitations and Solutions of existing Data Analytics Architecture, Attributes of Big Data, Types of data, other technologies vs Big Data.

UNIT-II

HADOOP ARCHITECTURE AND HDFS

Topics - What is Hadoop? Hadoop History, Distributing Processing System, Core Components of Hadoop, HDFS Architecture, Hadoop Master – Slave Architecture, Daemon types - Learn Name node, Data node, Secondary Name node.

UNIT –III

HADOOP CLUSTERS AND THE HADOOP ECOSYSTEM

Topics - What is Hadoop Cluster? Pseudo Distributed mode, Type of clusters, Hadoop Ecosystem, Pig, Hive, Oozie, Flume, SQOOP. Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-IV

HADOOP MAPREDUCE FRAMEWORK

Topics - Overview of MapReduce Framework, MapReduce Architecture, Learn about Job tracker and Task tracker.

A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New),Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner

UNIT-V

HADOOP ECOSYSTEM - I: Using Query Languages HIVE and PIG for data analytics,

Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

UNIT-VI

HADOOP ECOSYSTEM – II

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

BIG SQL : INTRODUCTION

TEXT BOOKS:

1. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
2. Hadoop in Action by Chuck Lam, MANNING Publ.
3. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss.

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne .
   Software Links:
3. Hadoop:http://hadoop.apache.org/
4. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
6. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16ITXO01: INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT**				

COURSE OUTCOMES:

Students are able to

1. Explain the basic concepts of Software Engineering and Process framework.
2. Define the various software process models and its requirements.
3. Outline software project management principles based on conventional software project Management.
4. Distinguish different Software Management life cycle phases
5. Define the artifacts and knowledge on Model Based Software Architecture.
6. Illustrate various software workflows and checkpoints of the process.

UNIT-I

INTRODUCTION TO SOFTWARE ENGINEERING:

The evolving role of software, Software Characteristics, Changing Nature of Software, Software myths,A Generic view of Process: Software engineering- A layered technology, a Process framework, The Capability Maturity Model Integration (CMMI), Process assessment, Product and Process.

UNIT-II

PROCESS MODELS:

The waterfall model, Incremental process models, Evolutionary process models, The Unified process, Software Requirements**:** User requirements, System requirements, Functional and non-functional requirements, the Software Requirements Document (SRS).

UNIT–III

CONVENTIONAL SOFTWARE MANAGEMENT AND ECONOMICS:

Conventional software Management performance, Software Economics, Improving Software Economics**:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT–IV

THE OLD WAY AND THE NEW:

The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.,Life cycle phases**:** Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT-V

ARTIFACTS OF THE PROCESS:

The artifacts sets, Management artifacts, Engineering artifacts, programmatic artifacts, Model based software architectures**:** A Management perspective and technical perspective.

UNIT-VI

WORK FLOWS OF THE PROCESS:

Software process workflows, Iteration workflows.

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCE BOOKS:

1.Software Engineering- Somerville, 9th edition, Pearson education.
2.Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
3.Software Project Management, Joel Henry, Pearson Education.

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16ITXO02: INTRODUCTION TO INTERNET OF THINGS (IoT)**				

COURSE OUTCOMES:

Students are able to

CO1. Define the fundamentals of IoT.

CO2. Illustrate the IoT design methodology.

CO3. Explain the Microcontroller and various IoT Platforms.

CO4. Construct the IoT using Raspberry Pi

CO5. Explain the basics of IoT sensors and communications.

CO6. Analyze applications of IoT in real time scenario.

UNIT-I

FUNDAMENTALS OF IOT:

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies, IoT Levels – Domain Specific IoTs – IoT vs. M2M.

UNIT-II

IOT DESIGN METHODOLOGY:

IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

UNIT-III

8051 MICROCONTROLLER:

Introduction to Microcontrollers, The 8051 Instruction Set, AT89S8253 Microcontroller, Assembly Language, Examples, Development systems,IoT Platform**:** IoT Platform overview, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.

UNIT-IV

BUILDING IOT WITH RASPBERRY PI:

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services.

UNIT-V

PROGRAMMING THE MICROCONTROLLER FOR IOT BASICS OF SENSORS & ACTUATORS:

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IoT – RASPBERRY PI /Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors, Communication**:** Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using wifi / Ethernet.

UNIT-VI

CASE STUDIES AND ADVANCED TOPICS:

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for IoT – Data Analytics for IoT – Software & Management Tools for IoT

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Charalampos Doukas “Building Internet of Things With the Arduino”, CreateSpace Independent Publishing Platform, 2012.
3. Milan Verle, “Architecture and Programming of 8051 Microcontrollers” 1st Edition mikro
4. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011
5. Matt Richardson & Shawn Wallace, “Getting Started with Raspberry Pi” O'Reilly (SPD), 2014.

REFERENCE BOOKS:

1. Luigi Atzor et.al, “The Internet of Things: A survey“, Journal on Networks, Elsevier Publications, October, 2010
2. Web Link 1: http://postscapes.com/(Accessed on 16 February 2016).
3. Web Link 2: http://www.theinternetofthings.eu/what-is-the-internet-of-things(Accessed on 16 February 2016).

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16BMXO01: INNOVATIONS AND ENTREPRENEURSHIP**				

COURSE OUTCOMES:

Students are able to

CO1: Comprehend the concept and levels of Innovation.

CO2: Discriminate the Micro &Macro perspectives & Innovation.

CO3: Appraise the creative Intelligence abilities.

CO4: Define and explain the basic concepts of Entrepreneurship & social responsibilities of an entrepreneur.

CO5: Estimates the importance of training for Entrepreneurs, Use feedback and Performance of trainees.

CO6: Discover the Challenges and Sickness in MSMEs.

UNIT-I

INNOVATION MANAGEMENT:

Concept of Innovation –Levels of Innovation –Incremental Vs Radical Innovation -Inbound and Outbound Ideation –Open and Other Innovative Ideation Methods- Systems approach to innovation- Innovation in the context of emerging economies-leadership and innovation.

UNIT-II

CREATIVE INTELLIGENCE:

Creative Intelligence Abilities – A Model Of Creative Intelligence – Convergent Thinking Ability – Traits Congenial To Creativity – Creative Personality And Forms Of Creativity.

UNIT-III

ENTREPRENEURSHIP:

Entrepreneurship characteristics –classification Of Entrepreneurship – Incorporation of Business - Role of Entrepreneurship in economic development – startups.

UNIT-IV

IDEA GENERATION AND OPPORTUNITY ASSESSMENT: Ideas in entrepreneurship – sources of new ideas- Techniques for generating ideas- Opportunity recognition – Steps in tapping opportunities

UNIT-V

PROJECT FORMULATION AND APPRAISAL:

Preparation of Detailed project Report (DPR) – content-Guidelines for Report preparation – project Appraisal techniques-economic- steps Analysis; Financial analysis; Market analysis; Technical feasibility.

UNIT-VI

INSTITUTIONS PROMOTING SMALL BUSINESS ENTERPRISES:

Central level Institutions; NABARD, SIDBI,NIC,KVIC,SIDIO,NSIC - State level Institutions-DICs – SFC- SSIDC- other financial assistance,Government policy and taxation benefits-government policy for SSIs – tax incentives and concessions- Non –tax concessions- Rehabilitation investment and Allowances

TEXT BOOKS:

1. Vasanth Desai, "Entrepreneurship' Himalaya Publishing House, New Delhi, 2012

2. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.

REFERENCES BOOKS

1. Pradip N Khandwalla, Lifelong Creativity, An Unending Quest, Tata McGraw Hill, 2004.

2. Vinnie Jauhari, Sudanshu Bhushan, Innovation Management, Oxford Higher Education, 2014

SEMESTER-VI/VIII	L	T	P	C
	3	-	-	3
OPEN ELECTIVE VI,VIII **16BMXO02: INDUSTRIAL SOCIALOGY AND PSYCHOLOGY**				

COURSE OUTCOMES:

Students are able to

CO1: Demonstrate an appreciation on different areas of Industrial Psychology and Sociology that have contributed to organizational effectiveness

CO2: Identify critical factors that affect behavior of individual and groups in an organization.

CO3: Analyze the importance of organizational design and culture prevailing in an organization.

CO4: Interpret the role and importance of Leadership and Motivation towards achieving objectives of individuals and groups in work environment.

CO5: Appraise the concept of change in the dynamic business organization.

UNIT I

INDUSTRIAL SOCIOLOGY :

Nature and Scope of Industrial Sociology-Development of Industrial Sociology, Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social status system, social relations in industry.

UNIT II

GROUP DYNAMICS:

Work Teams & Groups, Group Behavior, Group formation & development, Decision Making by Individuals , Groups Decision making process, individual influences, group decision process, Group dynamics

UNIT III

ORGANIZATIONAL CONFLICTS:

Concept - Causes and Consequences of Conflict-Conflict handling techniques-Emotional Intelligence - Inter Group Behavior and Collaboration.

UNIT IV

INDUSTRIAL PSYCHOLOGY :

Nature and Meaning of Industrial Psychology, Role of Industrial Psychology, Organizational Attitude, Motivation at work-Theories of Motivation (Theory X and Y, McClelland's Theory, Maslow's Need Theory, Herzberg's Two Factor Theory) Cultural Differences in Motivation

UNIT V

ORGANIZATIONAL DESIGN AND LEADERSHIP :

Organizational Design & Structure- Key organizational design process, Structural differentiations, factors influencing design of organizations, Leadership, Leadership vs. Management, Leadership Theories, Emerging issues in Leadership

UNIT VI

ORGANIZATIONAL CULTURE:

Functions of organizational culture, Organizational Socialization, Assessing Cultural Values and Fit, Cross Cultural issues, Managing Change Forces for change in Organization, Resistance to change and change management.

TEXT BOOKS:

1.Nelson, Quick and Khandelwal, ORGB : An innovative approach to learning and teaching Organizational Behaviour. A South Asian Perspective, Cengage Learning, 2012

2.Udai Pareek, Understanding Organizational Behavior, Oxford University Press.

REFERENCE BOOKS:

1.Gisbert Pascal, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.

2.Schneider Engno V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi,