P.S.R. ENGINEERING COLLEGE

(An Autonomous Institution & Affiliated to Anna University, Chennai)

SIVAKASI - 626140

B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING

UG REGULATION-2012

CURRICULUM AND SYLLABI

[1st To 8th Semester]

THIS IS THE FINAL VERSION OF THE SYLLABUS AS RATIFIED AND APPROVED BY THE ACADEMIC COUNCIL OF THE COLLEGE IN THE MEETINGS HELD ON 7/7/2012, 1/6/2013 & 12/4/2014

DEAN(ACAD)

PROGRAMME OUTCOMES OF B.E – ELECTRONICS AND COMMUNICATION ENGINEERING:

- Apply knowledge of mathematics, physical sciences and Electronics and Communication Engineering fundamentals.
- Able to identify, formulate, analyze and solve Electronics and Communication Engineering problems.
- Able to design and realize Electronics and Communication systems to meet desired needs within practical constraints such as economical, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
- Able to investigate and conduct experiments, as well as to analyze and interpret data.
- Use of techniques, skills, and modern engineering tools necessary for engineering practice.
- Contextual knowledge to assess societal, health, safety, legal and cultural issues related to Engineering.
- Realize the impact of Electronics and Communication engineering solutions in a global, economic and environmental context.
- Apply ethical principles and commitment to professional ethics and responsibility.
- Function as an individual and as a member or leader in multidisciplinary teams.
- Communicate effectively with the engineering commUNITy and society at large.
- Knowledge and understanding of management and business practices and their limitations.
- Recognize the need for, and have the ability to engage in life-long learning.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

- Design, simulate and analyze diverse problems in the field of telecommunication.
- Able to design and analyze varied electronic circuits for applications.
- Apply signal and image processing techniques to analyze a system for applications.
- Construct, test and evaluate an embedded system and control systems with real time constraints.

REGULATIONS FOR UG PROGRAMME (B.E/B.Tech) CANDIDATE ADMITTED DURING THE ACADEMIC YEAR 2012 - 2013 AND ONWARDS
[UG Regulation-2012]

I. CONDITIONS FOR ADMISSION

Candidates for admission to the first year of the four year B.E / B.Tech Degree course shall be required to have passed

i) The higher secondary examination (academic stream) conducted by the Government of Tamilnadu with Mathematics, Physics and Chemistry

(or)

ii) The higher secondary examination(Vocational stream offering the vocational groups of Engineering and Technology)conducted by the Government of tamilnadu

(or)

iii) The diploma examinations in engineering conducted by the state board of technical education and training, Tamilnadu

(or)

iv) An examination of any university or authority, accepted by the Anna University as equivalent thereto

(or)

v) Any other examinations as notified by the Government of Tamilnadu

LATERAL ENTRY ADMISSION (YEAR 2013 - 2014 AND ONWARDS)

Candidate who have passed the Diploma in Engineering / Technology conducted by the State Board of Technical Education and training are eligible for admission to the third semester under lateral entry scheme of the B.E / B.TECH degree programmes.

Any other conditions as notified by the Government of Tamilnadu

2. BRANCHES OF STUDY

Branches will be offered at the time of admission to the course. The following are the courses offered in this college.

1) B.E-Civil Engineering
2) B.E-Mechanical Engineering
3) B.E-Electrical and Electronics Engineering
4) B.E-Electronics and Communication Engineering
5) B.E-Computer Science and Engineering
6) B.TECH-Information Technology
7) B.TECH-Bio-Technology

3. STRUCTURE OF PROGRAMMES

3.1 Every programme shall have a curriculum with well-defined syllabi comprising theory and practical courses such as:

i) General core courses comprising Mathematics, Basic sciences, Engineering Sciences, Humanities and Engineering.
ii) Core courses of Engineering/ Technology.
iii) Elective courses for specialization in related fields.
iv) Workshop practice, computer practice, engineering graphics, laboratory work, industrial training, seminar presentation, project work, industrial visit, etc.,
v) NSS/RRC/ISTE/CISCO/IEEE/YRC/SPORTS activities for character development.

3.2 The subjects of study shall be both theory and practical and shall be in accordance with the prescribed syllabus.

3.3 Each semester curriculum shall normally have a blend of lecture courses not exceeding 6 and practical courses not exceeding 4.

3.4 A student who has passed all the subjects prescribed in the curriculum for the award of the degree shall not be permitted to-enroll to improve his/her marks in a subject or the aggregate marks.

3.5 The medium of instruction, examination and project report shall be in English, expect for courses on language other than English.

4. DURATION OF THE PROGRAMME

The duration of the programme for the degree of B.E/B.TECH programme shall be four academic years with semester pattern for HSC students and three years for lateral entry students. The number of working days will be 90 days (which includes the days for conducting UNIT tests.), 450 hours, or 540 periods of each 50 minutes duration for semester pattern. The number of working days is to be calculated excluding study holidays, Government holidays, and end-semester examination days. The head of the department shall ensure that every teacher imparts instruction as per the number of period specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

5. SYSTEMS OF EXAMINATION

Performance in each course of study shall be evaluated based on i) Continuous internal assessment throughout the semester and ii) an end semester examination**.**

Theory

End semester examination will be conducted in all the theory subjects of study at the end of each semester for all the courses. The maximum marks of each subject shall be 100, out of which the continuous internal assessment will carry 25 marks, while the end semester examination will carry 75 marks.

To derive the internal mark the following guidelines are to be followed:

1) Test (3 Nos) {Each test is to be conducted for 60 marks} : 60 marks
2) Assignment /Seminar/mini project
   a) Assignment 2 Nos (or)

b) 1 Assignment +1 Seminar (or)	: 30 marks
c) Mini project	
d) Attendance*	: 10 marks
	100 marks

Total 100 marks should be reduced to 25 marks

*Attendance (10 marks)

Percentage of attendance	Marks
75	2
76-80	4
81-85	6
86-90	8
91 and above	10

Practical

The practical classes for all the practical/lab component courses will be assessed continuously and marks will be entered in the prescribed Performa. The progress of classes will be monitored by a committee formed by the concerned head of the departments/ professor in-charge of the course to ensure that the concerned staff conducts the laboratory experiments as specified in the syllabus. The maximum marks for the practical/lab component courses shall be 100, out of which the continues internal assessment will carry 25 marks, while the end semester practical examination will carry 75 marks. If any practical course contains Part A Part B components, the maximum marks for each part of the lab will be 50 marks, while the end semester practical examination will carry 37.5 marks. The internal and external examiners shall conduct the end semester practical examination and award marks. To derive the internal mark the following guidelines are to be followed.

i)	Continuous Assessment	: 50 marks
ii)	Test (minimum one)	: 40 marks
iii)	Attendance	: 10 marks

Total 100 marks should be reduced to 25 marks

*Attendance (10) marks

Percentage of attendance	Marks
75	2
76-80	4
81-85	6
86-90	8
91 and above	10

Project work and Viva-voce

For the project work and vivo-voce examination the maximum marks shall be 200 comprising 150 marks for internal assessment and 150 for the end semester examination. The award of the end semester marks for 150 shall be evaluated by both the internal and external examiners. Out of 150 the project report shall carry a maximum of 50 marks (same mark must be awarded to every student of the project group) while the viva-voce **examination shall carry 100 marks** (awarded to each student of the project group based on the individual performance in the viva-vice examination).

For internal mark:

Work assessed by Guide/Supervisor : 50 % weight
Work assessed by Committee : 50 % weight
(Committee consists of 3 members one among them is the Guide/Supervisor)

6. REQUIREMENTS FOR EXAMINATION AND ATTENDANCE

A candidate who has fulfilled by the following conditions shall be deemed to have satisfied the requirements for completions of a semester.

6.1 i. A candidate will be permitted to appear for the examination for any semester, only if he/she secures not less than 75% of attendance in the number of working days during that semester, if it shall be open to chairman of the academic council or any authority delegated with such powers (by the governing body) to grant condonation (based on the recommendation of the head of the department) to a candidate who has failed to secure 75% of the attendance for valid reasons and has secured not less than 66% of the attendance. Such exemptions can be allowed only TWO times during his/her entire course of study.

ii Candidate representing university in State/National/International /Inter University sports events, co and extra-curricular activities, paper or project presentation with prior permission form the head of the institution are given exemption up to 10% of the required attendance and such candidates shall be permitted to appear for the current semester examinations.

iii his/her conduct and progress have been certified to be satisfactory by the concerned head of the department.

iv Condonation can be allowed only two times during his/her entire course of study.

6.2 Candidates who do not complete the semester (as per clause 6.1) will not be permitted to write the end semester examination and are not permitted go to next semester. They are required to repeat the incomplete semester in the next academic year.

7. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

i. Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (Topic Covered) for each course. This should be submitted to the Head of the departments periodically (at least 3 times in a semester) for checking the syllabus coverage and the records of test marks

and attendance. The Head of the department shall affix the signature and date after due verification at the end of the semester. This record should be verified by the Head of the Institution who will keep this document in safe custody (for five years).

ii. Theory Courses (25 Marks):

(a) UNIT Tests [60% Weight]

Three tests each carrying sixty (60) marks shall be conducted by the department / Institution. The total marks obtained in all tests put together out of 180, shall be reduced to 60 marks and rounded to nearest integer (this implies equal weight to all the three tests). However retest at the discretion of the head of the department may be conducted for the deserving candidates.

(b) Assignment / Seminar / Miniproject [30% weight]

i) **Assignment:**
Two assignments each carrying 15 marks and requiring work of average 5 to 6 hours of study and written work of average 5 to 6 hours shall be given to be carried out by each student in a separate assignment folder, duly indexed with headings, date of submission, Marks, remarks and signature of faculty with date etc.

ii) **Assignment and seminar**
A student has to carry out one assignment and one seminar carrying 15 marks each. An assignment normally requires work of average 5 to 6 hours of study and written work of average 5 to 6 hours which has to submitted in a separate assignment folder, duly indexed with headings, date of submission, Marks, remarks and signature of faculty with date etc.,

The student has to make one technical seminar on current topics related to the specialization. The students are expected to submit a report of his / her presentation. The seminar will be assessed by the course tutor with common parameters as described by the department.

iii) **Mini Project**
A student has to carry out mini project carrying 30 marks either in hardware or software with the approval of the head of the department.The student has to submit a report before the end of the semester. Mini project will be assessed based on the model presentation and report as decided by the department.

(c) Attendance [10% weight]

Attendance (10) marks

Percentage of attendance	**marks**
75	2
76-80	4
81-85	6
86-90	8
91 and above	10

The internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2012 to 2013 and onwards. if a candidates scores a minimum of 50% marks in the end semester examination, after three attempts(first attempt + two more attempts), he / she would be declared as passed in that examination.

iii. Practical Subjects [25 marks)

Every practical exercise / experiment shall be evaluated based on conduct of exercise / experiment and records maintained. There shall be at least one test. The criteria for determining the internal assessment marks are:

Experiment / Record / Average Practical classes' performance	: 50 % Weight
Practical Test	: 40%Weight
Attendance	: 10 % Weight

Total 100 marks should be reduced to 25 Marks.

iv. Project Work

There shall be three assessments during the semester by a review committee. The students shall make presentation on the progress made before the committee. The Head of the Institution shall constitute the review committee for each branch of study. The criteria for arriving the internal assessment marks for the project work evaluated for 50 marks are:

Work accessed by the Project Guide	:	50% weight
Assessment by a three (3)-member internal review committee (Guide will be one of the members of the committee)	:	50%weight

The internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2012-2013 and onwards. If a candidate scores a minimum of 50% marks only in the end semester examination, after three attempts (First attempt + two more attempts), he / she would be declared as a passed candidate in that examinations.

8. PROCEDURE FOR COMPLETING THE COURSE

(i) A candidate who has for some reason discontinued the course can join the course of study of any semester only at the time of its normal commencement in the institution for regular students upon satisfying all the following conditions.

(a) he/she should have completed the course of study of the previous semester.
(b) he/she should be eligible to register for the examination and satisfy rule 8(iii).
(c) he/she should have registered for all the examination of the previous semesters.

(ii) A candidate will be permitted to proceed from one semester to the next higher semester only if he/she has satisfied the regulation for eligibility to appear for the end semester examination in the concerned semester, subject to the condition that the candidate should register for all the arrear subjects of lower semesters along with the current (higher) semester subject.

(iii) A candidate should have completed B.E/B.Tech, degree course within a period of SEVEN (or 14 semesters) consecutive academic years (Six consecutive years or 12 semesters for lateral entry students) from the date of admission to the course, even if the candidate discontinues and rejoins subsequently, to be eligible for the award of the degree. The minimum and maximum period for completion of the U.G. Programmes (B.E/B.Tech) are given below.

B.E /B.Tech. (Full Time)	Minimum Number of Semester	Maximum Number of Semesters
HSC Candidates	8	14
Lateral Entry Candidates	6	12

9. REQUIREMENTS TO APPEAR FOR END SEMESTER EXAMINATION

A candidate shall normally be permitted to appear for the end semester examination of the current semester if he/she has satisfied the semester completion requirements (Subject to clause 6.1) and has registered for examination in all course of that semester. Registration is mandatory for current semester examination as well as appear examination failing which the candidate will not be permitted to move to the higher semester.

10. PASSING MINIMUM AND CLASSIFICATION OF SUCCESSFUL CANDIDATE

(i) For each subject the examination will be conducted for 100 marks. A candidate who secures not less than 50% of the total marks in the end semester examinations and internal assessment put together in both theory and practical courses, including project work, subject to securing a minimum of 50% in the end-semester examination, wherever applicable, shall be declared to have passed the examination in that subject. When the marked secured for 100 is converted to 75, minimum 37 marks must be secured for pass. If any programme, during any semester, conducts the laboratory in two parts, say part a A and Part B, a candidate should register and appear for both parts in the end semester practical examination. If a candidate for any reason is absent in any one part of the practical examination, despite his/her presence in the other part, he/she is declared as fail in both parts A and B (marked as absent in end semester examination) and should appear again for both part A and B in the next attempt. For a pass, a candidate should secure a minimum of 50% in each part and final mark secured is the sum of marks secured in Part A and B.

(ii) A candidate who successfully completes the course requirements and has passed all the prescribed examinations in all the eight semester within a maximum period of seven years reckoned from the commencement of the first semester to which the candidate was admitted is eligible to get the degree.

(iii) A candidate who qualifies for the degree by passing the examination in all subject of the entire course in first attempt within a period of four consecutive academic years from the date of admission to the course and secures a CGPA of not less than 8.5 for the entire course shall be declared to have passed the examination for the degree in FIRST CLASS WITH DISTINCTION. For this purpose, the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.

(iv) A candidate transferred from other institution, who qualifies for the degree by passing the examination in all subjects of the entire course in first attempt within a period of four consecutive academic years from the date of admission to the course and secures a CGPA of not less than 8.5 for the entire course shall be declared to have passed the examination for the degree in FIRST CLASS WITH DISTINCTION. For this purpose, the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.

(v) A candidate who qualifies for the award of the degree having passed the examination in all the subject of the course in the semester first to eight within a maximum period of ten consecutive semester after his/her commencement of study in the first semester and secures a CGPA of not less than 6.5 for the entire course shall be declared to have to have passed the examination for the degree in FIRST CLASS. For this purpose, the authorized break of the study will not be counted for the purpose of classifications.

(vi) All other successful candidates shall be declared to have passed the examination for the degree in SECOND CLASS.

(vii) A candidate who is absent in semester examination in a course/ project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification.

11. ISSUE OF MARK SHEET

Individual mark sheet for each semester will be issued, through the head of the department concerned, after the publication of the result.

The mark sheet will contain credit, grade, grade point and result status for the course concerned.

12. MALPRACTICE

If a student indulges in malpractices in any of the end semester examination, he/she shall be liable for pUNITive action as prescribed by the Anna University, Chennai from time to time.

13. REVALUATION

(i) Copies of answer script for the theory course(s) can be obtained from the Office of the Controller of Examinations on payment of a prescribed fee specified for this purpose through proper application.

(ii) A candidate can apply for revaluation of his/her examination answer paper in a theory course, within a week from the declaration of results, on payment of a prescribed fee through proper application to the Office of the Controller of Examinations, as per the norms given by the Chairman Academic Council. Revaluation is not permitted for practical course and for project work.

(iii) Re totaling is permissible for all arrear and current theory subjects.

14. ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be declared eligible for the award of the B.E/B.Tech. degree provided the candidate has

(i) Successfully completed the course requirements and has passed all the prescribed examinations in all the 8 semesters within a maximum period of 7 years (6 semesters within a maximum period of 6 years for lateral entry candidates) from the commencement of first semester (third semester for lateral entry) to which the candidate was admitted.

(ii) The syndicate of the university must have approved the award of degree.

15. CLASS COMMITTEE

15.1 A class committee consists of teachers of the concerned class, student representatives and a chairperson who is not teaching the class. It is the like the "QUALITY CIRCLE" (more commonly used in industries) with the overall goal of improving he teaching-learning process. The functions of the class committee include.

* Solving problems experienced by students in the class room and in the laboratories.

* Clarifying the regulations of the degree programme and details of rules therein.

* Informing the student representatives the academic schedule including the dates of assessments and the syllabus coverage for each assessment.

* Informing the student representatives the details of regulations regarding weight used for each assessment. In the case of practical course (laboratory/drawing/project work/seminar etc.,) the breakup of marks for each experiment/exercise/module of work, should be clearly discussed in the class committee meeting and informed to the students.

* Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.

* Identifying the weak students, if any, and requesting the teachers concerned to provided some additional or guidance of coaching to such weak students.

15.2 The class committee for a class under a particular branch is normally constituted by the head of the department. However, if the students of different branches are mixed in each class of the first semester (generally common to all branches), the class committee is to be constituted by the head of the institution.

15.3 The class committee shall be constituted on the first working day of any semester or earlier.

15.4 At least 6 student representatives (usually 3 boys and 3 girls) shall be included in the class committee.

15.5 The chairperson of the class committee any invite the faculty adviser(s) and the head of the department to the meeting of the class committee.

15.6 The head of the institution may participate in any class committee of the institution.

15.7 The chairperson is required to prepare the minutes of every meeting, submit the same to the head of the institution within two days of the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the authorities concerned. The same shall be brought to the notice of the authority by the head of the institutions.

15.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weight of assessments within the framework of the regulations. Two or three subsequent meetings may be held at suitable intervals, During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

16. FACULTY ADVISER

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department of the student will attach a certain number of students to a teacher of the Department who shall function as Faculty Adviser for those students throughout their period of study. Such Faculty Adviser shall advise the students and monitor the courses taken by the students, check the attendance and progress of the students attached to him *I* her and counsel them periodically. If necessary, the faculty adviser may also discuss with or inform the parents about the progress of the students.

17. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group of students shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course Coordinator. The nomination of the Course Coordinator

shall be made by the Head of the Department /Head the Institution depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The "Course committee" shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Wherever it is feasible, the course committee may also prepare a common question paper for the test(s).

18. PROVISION FOR WITHDRAWAL FROM EXAMINATION

(i) A candidate may, for valid reasons, be granted permission to withdraw from appearing for the examination in any course or courses of only one semester examination during the entire duration of the degree programme. Also only one application for withdrawal is permitted for that semester examination in which withdrawal is sought. Withdrawal from appearing for the examination in any course or courses in the middle of the examination is not permitted.

(ii) Withdrawal application shall be valid only if the candidate is, otherwise, eligible to write the examination and if it is made prior to the commencement of the last examination in that semester and duly recommended by the Head of Department and approved by the Head of the Institution.

(iii) Withdrawal shall not be construed as an appearance for the eligibility of a candidate for first class with distinction.

(iv) Withdrawal is possible only if the candidate satisfies the attendance requirements [as per clause 6.1]

19. TEMPORARY BREAK OF STUDY FROM A PROGRAMME

(i) A candidate is not normally permitted to temporarily break the study. However if a candidate intends to temporarily discontinued the programme in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the programme in a later than the last date for registering for the semester examinations of the semester in question, through the head of the department starting the reasons thereof.

(ii) The candidate permitted to rejoin the programme after the break shall be governed by the rules and regulations in force at the time of rejoining.

(iii) The duration specified for passing all the course for the purpose of classification vide clause 10(iii), 10(iv) and 10(v) shall be increased by the period of such break of study permitted.

(iv) The period for completion of the programme reckoned from, the commencement of the first/third semester to which the candidate was admitted shall not exceed the maximum period specified in clause 8(iii) irrespective of the period of break of

study in order that he/she may be eligible for the award of the degree (vide clause 14).

(v) If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'break of study' and clause 19(iii) is not applicable for this case.

20. RANK OF STUDENT

A candidate who qualifies for the degree by passing the examination in all subjects of the entire course in first attempt within a period of four (three for lateral entry) consecutive academic years from the date of admission to the course can be given his/her position in the class as rank. The rank is determined from III semester to VIII semester examination CGPA. Student transferred from other institution to P.S.R. Engineering College are not eligible for rank.

21. PROCUDURE FOR USING SCRIBER

If candidate is physically handicapped (in case of accidents/ill health) at the time of examination, he/she may be permitted to use a scriber to write the examination. In such case 30 minutes, extra time will be permitted. The scriber shall be a non-engineering student/graduate.

22. INDUSTRIAL VISIT

Every student is required to undergo one industrial visit, starting from the third semester of the programme. Every teacher shall take the students are least for one industrial visit in a year.

23. PERSONALITY AND CHARACTER DEVELOPMENT

All students shall enroll, on admission, in any one of their personality and character development programmes (NSS/YRC/RRC/ISTE/IEEE/CISCO). The training shall include classes to hygiene and health awareness and training in first aid.

- NATIONAL SERVICE SCHEME (NSS) will have social service activities in and around the college/institution.
- YOUTH RED CROSS (YRC) will have activities related to social service in and around college/institution.
- RED RIBBON CLUB (RRC) will have activities to improve health awareness among the people in and around the college campus.
- INDIAN SOCIETY FOR TECHNICAL EDUCATION (ISTE) will have activities to improve students technical skill and career development.
- INSTITUTION OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) will have activities to enhance professional students innovative skill.

- COMPUTER INFORMATION SYSTEM COMPANY (CISCO) will have activities to enhance professional student's innovative skill with help of enhanced human network.

While the training activities will normally be during weekends, the camp will normally be during vacation period.

24. DISCIPLINE

Every student is required to observe and decorous behavior both inside and outside the college and not to indulge in any activity, which will tend to bring down the prestige of the college. In the event act indiscipline being reported, the principal shall constitute a disciplinary committee consisting of three heads of department of which on should be from the faculty of the student, to inquire into acts in discipline. The disciplinary action is subject to review by the university in case the student represents to the university. Any expulsion of the student from the college shall be with prior concurrence from director of technical education/university.

25. CREDIT SYSTEM

The letter grade and the grade point are awarded base on percentage of marks secure by a candidate in individual course as detailed below:

Range of Total Marks	Letter Grade	Grade Points (GP)
90 to 100	S	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
55 to 59	D	6
50 to 54	E	5
0 to 49	U	0
INCOMPLETE	I	0

"U" denotes failure in the course.
"I" denotes incomplete as per clause 6.1 and hence prevention from writing end semester examination
"W" denotes withdrawal from the course.

After results are declared, grade sheets will be issued to each student which will contain the following details:

- The list of subjects enrolled the semester and the grades scored.
- The grade point average (GPA) for the semester and
- The cumulative grade point average (CGPA) of all subject enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of course registered and the points corresponding to the grades scored in those course, taken for all the course, to the sum of the number of credits of all the course in the semester.

$$GPA = \frac{\text{Sum of } [C \times GP]}{\text{Sum of } C}$$

Where C - Credit of a particular course
GP - Grade point obtained by the student in the respective course

CGPA will be calculated in a similar manner, considering all the course enrolled from first semester, "U", "T", and "W" grades will be excluded for calculating GPA and CGPA.

Each course is normally assigned certain number of credits with 1 credit per lecturer period per week, 1 credit per tutorial period per week, 1 credit for 2 periods of laboratory or practical or seminar or project work per week (2 credits for 3 or 4 periods of practical).

26. REVISION OF REGULATION AND CURRICULUM

The college may from time to time revise, amend of change the regulations, scheme of examinations and syllabus, if found necessary.

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REGULATION – 2012

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM & SYLLABI

Full time candidates admitted during 2012-2013 and onwards

S.No.	Sub. Code	Subject Name	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
SEMESTER I										
Theory										
1	12F1Z1	Technical English-I	25	75	100	3	1	0	4	----------
2	12F1Z2	Engineering Mathematics-I	25	75	100	3	1	0	4	----------
3	12F1Z3	Engineering Physics-I	25	75	100	3	0	0	3	----------
4	12F1Z4	Engineering Chemistry-I	25	75	100	3	0	0	3	----------
5	12F1Z5	Computing Fundamentals and C Programming	25	75	100	3	0	0	3	----------
6	12F1Z6	Engineering Graphics	25	75	100	1	0	3	4	----------
Practical										
7	12F1Z7	Physics and Chemistry Laboratory - 1	25	75	100	0	0	3	2	12F1Z3-Engineering Physics-I (CR) 12F1Z4-Engineering Chemistry-I (CR)
8	12F1Z8	Computer Practice Laboratory -1	25	75	100	0	0	3	2	12F1Z5-Computing Fundamentals and C Programming (CR)
9	12F1Z9	Engineering Practices Laboratory	25	75	100	0	0	3	2	----------
	Total				900	16	2	12	27	

S.No.	Sub. Code	Subject Name	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
SEMESTER II										
Theory										
1	12F2Z1	Technical English-II	25	75	100	3	1	0	4	12F1Z1-Technical English-I
2	12F2Z2	Engineering Mathematics-II	25	75	100	3	1	0	4	12F1Z2-Engineering Mathematics-I
3	12F2Z3	Engineering Physics-II	25	75	100	3	0	0	3	12F1Z3-Engineering Physics-I

4	12F2Z4	Engineering Chemistry-II	25	75	100	3	0	0	3	12F1Z4-Engineering Chemistry-I
5	12F2X5	Electric Circuits and Electron Devices (For ECE,CSE,IT branches)	25	75	100	3	1	0	4	12F2Z3-Engineering Physics-II (CR)
6	12F2X6	Basic Civil and Mechanical Engineering (For Circuit branches)	25	75	100	3	1	0	4	----------
Practical										
7	12F2Z7	Physics and Chemistry Laboratory - II	25	75	100	0	0	3	2	12F1Z7-Physics and Chemistry Laboratory – I 12F2Z3- Engineering Physics-II (CR) 12F2Z4- Engineering Chemistry-II (CR)
8	12F2Z8	Computer Practice Laboratory - II	25	75	100	0	0	3	2	12F1Z8-Computer Practice Laboratory -1
9	12F2X8	Electric Circuits and Electron Devices Laboratory (ECE,CSE,IT)	25	75	100	0	0	3	2	12F2X5-Electric Circuits and Electron Devices (CR)
	Total				900	18	4	9	28	

S.No.	**Sub. Code**	**Subject Name**	**Internal Marks**	**Final Exam Marks**	**Total Marks**	**Hrs & Credits**				**Pre requisite / Corequisite (CR)**
						L	**T**	**P**	**C**	
SEMESTER III										
Theory										
1	12MA31	Transforms and Partial Differential Equations	25	75	100	3	1	0	4	12F2Z2-Engineering Mathematics-II
2	12EC31	Electronic Circuits I	25	75	100	3	1	0	4	12F2X5-Electric Circuits and Electron Devices
3	12EC32	Digital Logic Techniques and Circuits	25	75	100	3	1	0	4	12F1Z5-Computing Fundamentals and C Programming 12F2X5-Electric Circuits and Electron Devices
4	12EC33	Networks and Transmission Lines	25	75	100	3	0	0	3	12F2Z2- Engineering Mathematics-II
5	12EC34	Data Structures and C++	25	75	100	3	0	0	3	12F1Z5-Computing Fundamentals and C Programming
6	12EC35	Electrical Engineering	25	75	100	3	0	0	3	12F2Z2-Engineering Mathematics-II 12F2Z3-Engineering Physics-II
Practical										
7	12EC36	Electronic Circuits I Lab	25	75	100	0	0	3	2	12F2X8-Electric Circuits and Electron Devices Laboratory

										12EC31- Electronic Circuits I (CR)
8	12EC37	Digital Lab	25	75	100	0	0	3	2	12F1Z5-Computing Fundamentals and C Programming 12EC32- Digital Logic Techniques and Circuits (CR)
9	12EC38	Data Structures and C++ Lab	25	75	100	0	0	3	2	12F2Z8-Computer Practice Laboratory – II 12EC34- Data Structures and C++(CR)
10	12HS31	Professional English-I	25	75	100	0	0	1	1	12F2Z2 - Technical English-II
Total					1000	18	3	10	28	

S.No.	Sub. Code	Subject Name	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
SEMESTER IV										
Theory										
1	12MA43	Probability and Random Processes	25	75	100	3	1	0	4	12MA31-Transforms and Partial Differential Equations
2	12EC41	Electronic Circuits II & Microprocessor	25	75	100	3	0	0	3	12EC31-Electronic Circuits I
3	12EC42	Linear Integrated Circuits and Applications	25	75	100	3	0	0	3	12EC31-Electronic Circuits I
4	12EC43	Electromagnetic Fields and Waveguides	25	75	100	3	1	0	4	12F2Z3-Engineering Physics-II
5	12EC44	Signals and Systems	25	75	100	3	1	0	4	12MA31- Transforms and Partial Differential Equations
6	12GE31	Environmental Science and Engineering	25	75	100	3	0	0	3	12F2Z4 - Engineering Chemistry-II
Practical										
7	12EC45	Electronic Circuits II & Microprocessor Lab	25	75	100	0	0	3	2	12EC36-Electronic Circuits I Lab 12EC41-Electronic Circuits II & Microprocessor (CR)
8	12EC46	Linear IC Lab	25	75	100	0	0	3	2	12EC36-Electronic Circuits I Lab 12EC37-Digital Lab 12EC42-Linear Integrated Circuits and Applications (CR)
9	12EC47	Electrical Engineering Lab	25	75	100	0	0	3	2	12EC35- Electrical Engineering

10	12HS41	Professional English-II	25	75	100	0	0	1	1	12HS31-Professional English-I
Total					1000	18	3	10	28	

S.No.	Course Code	Course Name	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
SEMESTER V										
Theory										
1	12EC51	Control Systems	25	75	100	3	1	0	4	12MA31- Transforms and Partial Differential Equations
2	12EC52	Computer Architecture and Organization	25	75	100	3	0	0	3	12EC32-Digital Logic Techniques and Circuits 12EC41-Electronic Circuits II & Microprocessor
3	12EC53	Digital Signal Processing	25	75	100	3	1	0	4	12EC44-Signals and Systems
4	12EC54	Antennas and Wave Propagation	25	75	100	3	0	0	3	12EC43-Electromagnetic Fields and Waveguides
5	12EC55	Analog Communication	25	75	100	3	0	0	3	12MA43-Probability and Random Processes
6	12EC56	Microcontrollers Architecture and Programming	25	75	100	3	0	0	3	12EC41-Electronic Circuits II & Microprocessor
Practical										
7	12EC57	Digital Signal Processing Lab	25	75	100	0	0	3	2	12EC44-Signals and Systems 12EC53-Digital Signal Processing (CR)
8	12EC58	Analog Communication Lab	25	75	100	0	0	3	2	12EC36-Electronic Circuits I Lab 12EC55-Analog Communication (CR)
9	12EC59	Microcontrollers Lab	25	75	100	0	0	3	2	12EC45-Electronic Circuits II & Microprocessor Lab 12EC56-Microcontrollers Architecture and Programming (CR)
10	12HS51	English for Employment - I	25	75	100	0	0	2	1	12HS41-Professional English-II
Total					1000	18	2	11	27	

S.No.	Course Code	Course Name	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
SEMESTER VI										
Theory										
1	12GE32	Professional Ethics in Engineering	25	75	100	3	0	0	3	------
2	12EC61	VLSI Design	25	75	100	3	0	0	3	12F2X5-Electric Circuits and Electron Devices 12EC32-Digital Logic Techniques and Circuits
3	12EC62	Digital Communication	25	75	100	3	0	0	3	12EC55-Analog Communication
4	12EC63	Embedded Systems	25	75	100	3	1	0	4	12EC56-Microcontrollers Architecture and Programming
5	12EC64	Computer Communication and Networks	25	75	100	3	0	0	3	12EC55-Analog Communication
6	-	Elective I	25	75	100	3	0	0	3	------
Practical										
7	12EC65	VLSI Lab	25	75	100	0	0	3	2	12EC37-Digital Lab 12EC61-VLSI Design (CR)
8	12EC66	Digital Communication Lab	25	75	100	0	0	3	2	12EC58-Analog Communication Lab 12EC62-Digital Communcation (CR)
9	12EC67	Computer Networks Lab	25	75	100	0	0	3	2	12EC64-Computer Communication and Networks (CR)
10	12HS61	English for Employment - II	25	75	100	0	0	2	1	12HS51-English for Employment – I
		Total			1000	18	1	11	26	

S.No.	Course Code	Course Name	Internal Marks	Final Exam Marks	Total Marks	Hrs & Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
SEMESTER VII										
Theory										
1	12EC71	Microwave and RF Systems	25	75	100	3	0	0	3	12EC31-Electronics Circuits I 12EC33-Networks and Transmission Lines 12EC43 - Electromagnetic Fields and Waveguides 12EC61-VLSI Design

2	12EC72	DSP Architecture and its Applications	25	75	100	3	0	0	3	12EC53-Digital Signal Processing
3	12EC73	Wireless Communication	25	75	100	3	0	0	3	12EC62-Digital Communication
4	12EC74	Fiber Optic Communication	25	75	100	3	0	0	3	12EC33-Networks and Transmission Lines 12EC62-Digital Communication
5	-	Elective II	25	75	100	3	0	0	3	------
6	-	Elective III	25	75	100	3	0	0	3	------
Practicals										
7	12EC75	Microwave and Optical Laboratory	25	75	100	0	0	3	2	12EC54-Antennas and Wave Propagation 12EC71-Microwave and RF Systems (CR)
8	12EC76	Signal Processors Lab	25	75	100	0	0	3	2	12EC53-Digital Signal Processing 12EC72-DSP Architecture and its Applications (CR)
Total					800	18	0	6	22	

S.No.	**Course Code**	**Course Name**	**Internal Marks**	**Final Exam Marks**	**Total Marks**	**Hrs & Credits**			
						L	**T**	**P**	**C**
SEMESTER VIII									
Theory									
1	-	Elective IV	25	75	100	3	0	0	3
2	-	Elective V	25	75	100	3	0	0	3
Practicals									
3	12EC81	Project Work and Viva voce	25	75	100	0	0	12	6
Total					300	6	0	12	12

Credits (I &II Semesters) : 55

Credits (III &VIII Semesters): 143

Total Credits (I to VIII Semesters): 198

LIST OF ELECTIVES

S.No.	Course Code	Course Name	Internal Marks	Final Exam Marks	Total Marks	Hrs &Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
VI – SEMESTER ELECTIVES										
1	12MA61	Numerical Methods for Engineering Applications	25	75	100	3	0	0	3	12MA31-Transforms and Partial Differential Equations
2	12EC6A	Electronic Measurements and Instrumentation	25	75	100	3	0	0	3	12F2X5-Electric Circuits and Electron Devices
3	12EC6B	TV and Video Engineering	25	75	100	3	0	0	3	12EC55-Analog Communication
4	12EC6C	Acoustics Engineering	25	75	100	3	0	0	3	12F2Z3-Engineering Physics-II
5	12EC6D	PCB Design and Testing	25	75	100	3	0	0	3	12EC42-Linear Integrated Circuits and Applications 12EC61-VLSI Design
6	12EC6E	Database Management Systems	25	75	100	3	0	0	3	12F1Z5-Computing Fundamentals and C Programming 12EC34- Data Structures and C++

S.No.	Course Code	Course Name	Internal Marks	Final Exam Marks	Total Marks	Hrs &Credits				Pre requisite / Corequisite (CR)
						L	T	P	C	
VII – SEMESTER ELECTIVES										
1	12MG52	Principles of Management	25	75	100	3	0	0	3	------
2	12EC7A	Software Engineering	25	75	100	3	0	0	3	------
3	12EC7B	Digital Image Processing	25	75	100	3	0	0	3	12EC53-Digital Signal Processing
4	12EC7C	Agriculture Electronics	25	75	100	3	0	0	3	12EC41-Electronic Circuits II & Microprocessor 12GE31-Environmental Science and Engineering
5	12EC7D	Low Power VLSI	25	75	100	3	0	0	3	12EC61-VLSI Design
6	12EC7E	Radar and Navigational Engineering	25	75	100	3	0	0	3	12EC54-Antennas and Wave Propagation
7	12EC7F	Medical Electronics	25	75	100	3	0	0	3	12EC41-Electronic Circuits II & Microprocessor 12EC42-Linear Integrated Circuits and Applications
8	12EC7G	Automotive Electronics	25	75	100	3	0	0	3	12EC63- Embedded Systems

9	12EC7H	Domestic and Entertainment Electronics	25	75	100	3	0	0	3	12F2X5-Electric Circuits and Electron Devices
10	12EC7I	Power Electronics	25	75	100	3	0	0	3	12F2X5-Electric Circuits and Electron Devices 12EC35- Electrical Engineering

S.No.	**Course Code**	**Course Name**	**Internal Marks**	**Final Exam Marks**	**Total Marks**	**Hrs & Credits**				**Pre requisite / Corequisite (CR)**
						L	**T**	**P**	**C**	
VIII – SEMESTER ELECTIVES										
1	12MG71	Total Quality Management	25	75	100	3	0	0	3	------
2	12EC8A	Cable and Fiber Technology	25	75	100	3	0	0	3	12EC74-Fiber Optic Communication
3	12EC8B	Cyber Crime and Digital Forensics	25	75	100	3	0	0	3	12EC64-Computer Communication and Networks
4	12EC8C	Satellite Communication	25	75	100	3	0	0	3	12EC33-Networks and Transmission Lines 12EC43-Electromagnetic Fields and Waveguides
5	12EC8D	Multimedia Communication	25	75	100	3	0	0	3	12EC62-Digital Communication 12EC64-Computer Communication and Networks
6	12EC8E	High Speed Networks	25	75	100	3	0	0	3	12EC64-Computer Communication and Networks
7	12EC8F	Introduction to MEMS System Design	25	75	100	3	0	0	3	12EC61- VLSI Design 12EC71-Microwave and RF Systems
8	12EC8G	Simulation of Communication Systems and Networks	25	75	100	3	0	0	3	12EC62-Digital Communication 12EC73- Wireless Communication
9	12EC8H	Robotics and Automation	25	75	100	3	0	0	3	12EC56-Microcontrollers Architecture and Programming
10	12EC8I	Spread Spectrum Techniques	25	75	100	3	0	0	3	12EC62-Digital Communication 12EC73- Wireless Communication

12F1Z1	TECHNICAL ENGLISH - I		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites:	---					
Aim:	To improve English communication skill with relevance to technical context.					
Course Objectives:	• To show the basic knowledge of English Language and grammar. • To construct written communication with the mechanics of Writing. • To develop error-free communication. • To summarize the text. • To improve the basic knowledge of Business Communication.					
Course Outcomes:	1. Relate basic grammar and structure of a language with relevance to technical vocabulary. 2. Analyze the technical English resources with reading skill. 3. Develop technical communication skill in writing. 4. Distinguish the sounds of English with Technical audio resources. 5. Adapt Basic English language skill for effective oral communication. 6. Improve the basic knowledge of business Communication.					

UNIT-I FOCUS ON LANGUAGE 12

General Vocabulary- prefix, suffix –Denotative & connotative- Parts of Speech-Types of Sentences- Conditionals Connectors Concord -Tenses- -Active &Passive voice -Phrases & Clauses-Spelling& Punctuation-Cause & Effect-Correct use of words(parts of speech)-Question Tags-'wh'&'Yes/No'Type questions-Rearranging Jumbled Sentences-One-Word Substitution

UNIT-II READING 12

Reading for gist/Identifying information/gap filling-Reading different types of text like advertisement, instruction, manuals, report - Reading passage with multiple choice questions/cloze type passage/sentence matching/completing passage-Reading for flow chart completion/matching information/matching headings, Reading for sentence completion

UNIT-III WRITING 12

Writing Sentences for Brevity, Clarity and Simplicity-Writing Topic sentences/General Information/Description Paragraph-structuring an Essay-Writing effective conclusions-Writing a Process- Writing formal letter like Requisition letter, Placing an order, Quotation letter, Acknowledgement letter, Enquiry Letter, Complaint Letter, Permission Letter.

UNIT-IV LISTENING 12

Listening for Learning-Word Stress and Pronunciation practices-Listening for Specific information-Note taking-Listening to announcements- Listening to News on the radio/TV

UNIT-V SPEAKING 12

Introducing oneself–offering Suggestions and recommendations-Expressing opinions suggestions-(agreement/disagreement)-Role play- Purchase Manager& Customer, Customer care executive (voice) & Customer, Bank manager& Employee, Commenting on the basis of Discussion-Using Verbal & Non-verbal cues in speech-Using Familiar Expressions in different situations

TOTAL: 60 PERIODS

TEXT BOOK(S)

1. Department of Humanities & Social Sciences, Anna University, '*English for Engineers and Technologists*' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006.

REFERENCES

1 Cambridge BEC Preliminary 2 Student's Book with Answers : Examination papers from University of CambridgeESOL Examinations, Cambridge ESOL, PB, ISBN: 9780521544504

2 Meenakshi Raman and Sangeetha Sharma-"Technical Communication: English skills for Engineers"-Oxford University Press-2008,ISBN:0-19-569574-7

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1									2	3		3				
CO2				1					3	3		3				
CO3									1	2		3				
CO4					1				3	3		3	1			
CO5									2	3		3			1	
CO6				1				1	1	3	3	3				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z2	ENGINEERING MATHEMATICS - I		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites:	---					
Aim:	The course is aimed at developing the basic mathematical skills of engineering student.					
Course Objectives:	• To develop the basic mathematical knowledge and computational skills of the student in the areas of applied mathematics. • To develop the skills of the students in the area of Calculus, Three Dimensional Geometry and Matrices. • To make the student for appreciating the purpose of using Eigen value and Eigen Vector to create a new domain in which it is easier to handle the problems that is being investigated in Spectral Theory.					
Course Outcomes:	1. Able to find the inverse of given matrix and reduce matrix equation using Cayley-Hamilton theorem. 2. Elaborate given function as a power series using Taylor's series. 3. Apply double integration to find area between two curves. 4. Make use of Calculus in finding the envelope, Evolutes & Involutes. 5. Evaluate the shortest distance between two skew-lines and find equation of coplanar planes. 6. Classify Conic system in Three Dimensional Geometry.					

UNIT-I MATRICES 12

Characteristic equation - Eigen Values and Eigen vectors of a real matrix - Properties of Eigen values - Problem solving using Cayley-Hamilton - Similarity Transformation - Orthogonal Transformation of a Symmetric matrix to diagonal form - Quadratic form - Orthogonal reduction to canonical form

UNIT-II THREE DIMENSIONAL GEOMETRY 12

Introduction – Sphere - Tangent Plane - Plane Section of a Sphere – Lines – Skew Lines - Coplanar Lines – Equation of Cylinder - Right Circular Cylinder.

UNIT-III DIFFERENTIAL CALCULUS 12

Curvature - Radius of curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involutes and Evolutes – Envelope - Evolutes as Envelope of its normal.

UNIT-IV FUNCTIONS OF SEVERAL VARIABLES 12

Partial Derivatives - Euler's Theorem for homogeneous function - Total Derivative - differentiation of Implicit function – Jacobian - Taylor's Expansion - Maxima/Minima for function of two variables - Method of Lagrange's multipliers

UNIT-V MULTIPLE INTEGRALS 12

Double Integration – Cartesian and Polar co-ordinates – Change of order of Integration - Change of variable between Cartesian and polar co-ordinates – Triple integration – Area as a double integral – Volume as a triple integral

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. B.S.Grewal,'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers,Delhi,2005.
2. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001.
3. Dr.P.Kandasamy , Dr.K.Thilagavathy , Dr.K.Gunavathy , S. Chand & Company Ltd. Ram nagar, New Delhi.

REFERENCE(S)

1. Greenberg, M.D. Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman.M.K.,"Engineering Mathematics",Volume I and II Revised enlarged Fourth Edition, The National Publishing Cpompany,Chennai,2004.
3. Veerarajan.T"Engineering Mathematics",Fourth Edition,Tata McGraw – Hill publishing company Ltd,New Delhi,2005.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1								2	3	1	3	3
CO2	2	3	2	2								1	2	2	2	2
CO3	3	3	3									3	2	1	2	2
CO4	2	1	2									2	2	2	2	3
CO5	3	2	3	1								2	2	2	2	2
CO6	2	2	2	1								3	2	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z3	ENGINEERING PHYSICS – I		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites:	---					
Aim:	To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.					
Course Objectives:	• To study the properties, production of ultrasonic waves and their applications in engineering field. • To study the principle, types and applications of LASER and the principle of fiber optic communication and its applications. • To study the basic concepts of Quantum physics and Crystal physics.					
Course Outcomes:	1. Apply the ultrasonics principles to engineering applications. 2. Summarize the principles of different types of laser and laser characteristics, industrial and medical applications of the laser. 3. Estimate the light propagation in optical fiber and analyze its structures, types and applications such as sensors, endoscope. 4. Interpret the Planck's theory in quantum phenomena. 5. Elaborate the basic concepts of compton scattering, Schrodinger equations and its application. 6. Identify the cubic UNIT cells (SC, BCC, FCC) and HCP, miller indices and crystal defects.					

UNIT-I ULTRASONICS 9

Introduction – Production – magnetostriction effect – magnetostriction generatorpiezoelectric effect – piezoelectric generator- Detection of ultrasonic waves properties – Cavitations – Velocity measurement – acoustic grating – Industrial applications – drilling, welding, soldering and cleaning – SONAR – Non Destructive Testing – pulse echo system through transmission and reflection modes – A,B and C –scan displays, Medical applications – Sonograms

UNIT-II LASERS 9

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coeffcients – derivation. Types of lasers – He-Ne, CO2 , Nd-YAG, Semiconductor lasers – Qualitative Industrial Applications – Lasers in welding, heat treatment, cutting – Medical applications – Holography & uses.

UNIT-III FIBER OPTICS & APPLICATIONS 9

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing – Fibre optical communication system (Block diagram) – Light sources – Detectors – Fibre optic sensors – temperature & displacement – Endoscope.

UNIT-IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation)- Compton effect- Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box.

UNIT-V CRYSTAL PHYSICS 9

Lattice – UNIT cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per UNIT cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal defects – point, line and surface defects- Burger vector.

TOTAL:45 PERIODS

TEXT BOOK(S)

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi(2003).
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics',S.Chand and company, Ltd., New Delhi, 2005.
3. K.Rajagopal , " Engineering Physics " Prentice – Hall of India Pvt. Ltd. New Delhi , 2007.

REFERENCE(S)

1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics',6th Edition, Thomson Brooks/Cole, Indian reprint (2007)
2. Rajendran, V and Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd, III Edition, New Delhi, (2004).
3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2007).
4. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore, (2003).
5. Chitra Shadrach and Sivakumar Vadivelu, 'Engineering Physics', Pearson Education, New Delhi, (2007).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2							2	2	2	2	2
CO2	3	3	2	2	1	2						2	2	2	2	2
CO3	3	3	2	2	2	2						2	2	2	2	2
CO4	2	3	2									1	1	3	3	2
CO5	2	2	1		1	2	1					2	1	3	3	2
CO6	3	3	2	2	2	2	1					2	1	3	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z4	ENGINEERING CHEMISTRY – I		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites:	---					
Aim:	To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.					
Course Objectives:	• The student should be conversant with the principles of water characterization and treatment for potable and industrial purposes. • Principles of polymer chemistry and engineering applications of polymers. • Industrial applications of surface chemistry. • Conventional and non-conventional energy sources and energy storage devices. • To study the chemistry of engineering materials.					
Course Outcomes:	1. Demonstrate the essential concept of water chemistry with their properties and applications of water technology. 2. Analyze the chemistry of polymers and composites. 3. Clarify the core concepts of surface chemistry. 4. Create the concepts of non-renewable energy sources and storage devices. 5. Examine and pertain the chemistry of engineering materials like abrasives. 6. Identify the chemistry of engineering materials like Lubricants and refractories. 7. Illustrate the structure and applications of engineering materials like nano materials.					

UNIT-I WATER TECHNOLOGY 9

Characteristics – alkalinity – types of alkalinity and determination – hardness –types and estimation by EDTA method (problems); Domestic water treatment –disinfection methods (Chlorination, ozonation. UV treatment) – Boiler feed water– requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – demineralization process – desalination and reverse osmosis.

UNIT-II POLYMERS AND COMPOSITES 9

Polymers-definition – polymerization – types – addition and condensation Polymerization – free radical polymerization mechanism – Plastics, classification–Preparation, properties and uses of PVC, Teflon, polycarbonate, polyurethane, Nylon-6, 6, PET- Rubber -vulcanization of rubber, synthetic rubbers – buty1Rubber, SBR, Composites – definition, types polymer matrix composites – FRP only.

UNIT-III SURFACE CHEMISTRY 9

Adsorption – types – adsorption of gases on solids – adsorption isotherms –Frendlich and Langmuir isotherms – adsorption of solutes from solution – role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement.

UNIT-IV NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear energy – fission and fusion reactions and light water nuclear reactor for Power generation (block diagram only) – breeder reactor – solar energy Conversion – Solar cells – wind energy – fuel cells – hydrogen – oxygen fuel cell – Batteries – Alkaline batteries – lead–acid, nickel–cadmium and lithium batteries.

UNIT-V ENGINEERING MATERIALS 9

Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks, Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism

of lubrication, liquid lubricants, - properties – viscosity index, flash and fire points, cloud and pour points, oiliness – solid lubricants – graphite and molybdenum sulphide. Nanomaterials – introduction to nanochemistry – carbon nanotubes and their Applications

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. Dr.A.Ravikrishnan, "Engineering Chemistry" Sri Krishna Publications, Chennai. (2002)
3. S.S. Dara "A text book of engineering chemistry" S.Chand and Co.Ltd., New Delhi (2006).

REFERENCE(S)

1. B.K.Sharma "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		1	3	2	3	1	1		1	1	2	1	1		
CO2	3	2	2	3	1		1						1	1		1
CO3	3										1		1	2	1	2
CO4	3	3		2	2	3	2			1		3	1	2	1	2
CO5	3										1		1	2	2	2
CO6	3				2									1		
CO7	3	3		2	1	2	1					3	1			

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z5	COMPUTING FUNDAMENTALS AND 'C' PROGRAMMING		L	T	P	C
			3	**0**	**0**	**3**
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites:	---					
Aim:	To provide an awareness to Computing and Programming.					
Course Objectives:	• To enable the student to learn the major components of a computer system. • To know the correct and efficient ways of solving problems. • To learn to program in C.					
Course Outcomes:	1. Determine the major components of computer and its functionalities. 2. Summarize evolution of computers generation and their classification. 3. Improve debugging and problem solving skills. 4. Solve computing problems using algorithm and flowchart. 5. Develop small programs related to simple/ moderate mathematical and logical problems in 'C'. 6. Develop programs in C language using arrays, functions, structures & pointers.					

UNIT I INTRODUCTION TO COMPUTERS 9

Introduction – Characteristics of Computers – Evolution of Computers - Computer Generations – Classification of Computers – Basic Computer organization – Number Systems- Computer Software –Types of Software – Software Development Steps – Internet Evolution – Basic Internet Terminology- Internet Services.

UNIT II PROBLEM SOLVING 9

Problem Solving Using Computers- Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudo code.

UNIT III INTRODUCTION TO C 9

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping.

UNIT IV ARRAYS AND FUNCTIONS 9

Arrays- Handling of Character Strings – User-defined Functions – Definitions – Declarations - Call by reference – Call by value.

UNIT V STRUCTURES AND POINTERS 9

Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a C Program : Some Guidelines

TOTAL: 45 PERIODS

TEXT BOOK

1. Ashok.N.Kamthane," Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, (2007).

REFERENCES

1. Pradip Dey,Manas Ghoush, "Programming in C", Oxford University Press.(2007).
2. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, (2006). (UNIT II, III, IV, and V).
3. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India, (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2005).
5. E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGRaw-Hill Publishing Company Limited, (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1		2							1		2		3
CO2				2								1			2	3
CO3	3	2	3	2	3	1						2	2		2	3
CO4	2	3	3	2								1			2	3
CO5	2	2	3	2	3	1						2	2		2	3
CO6	2	1	3	1	1	1						2			2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z6	ENGINEERING GRAPHICS		L	T	P	C
			1	0	3	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites:	---					
Aim:	To develop Graphic skills of the students.					
Course Objectives:	• To develop in student's graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.					
Course Outcomes:	1. Create the convention model for engineering graphics. 2. Examine the plane curves and free hand sketching. 3. Outline the projections of points, lines and plane. 4. Outline the projections of simple solids and their sectional views. 5. Illustrate the development of surfaces. 6. Evaluate isometric and perspective projections.					

UNIT I PLANE CURVES AND FREE HAND SKETCHING 12

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 12

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS 12

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 12

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL: 60 PERIODS

TEXT BOOK

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46 Th Edition, (2003).

REFERENCES

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
3. K. Venugopal and V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.IandII), Subhas Publications (1998).
6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill.
7. Publishing Company Limited (2008).Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2		2	1			1			2	2		1	
CO2	3	2	2		2	1			1			2	2	2	2	2
CO3	3	2	2		2				1			2	1		2	
CO4	3	2	3		2				1			2	1		2	2
CO5	3	2	3		2	1			1			2	1		2	1
CO6	2	2	2		2				1			2	1		2	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z7	PHYSICS & CHEMISTRY LABORATORY - I		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites/ Corequisites (CR):	12F1Z3 - Engineering Physics-I (CR) 12F1Z4 - Engineering Chemistry-I (CR)					
Aim:	To impart fundamental knowledge in various physics and chemistry experiments and train the students for systematic recording of experimental findings of various physics and chemistry parameters.					
Course Objectives:	The course should enable the students to: • measure the wavelength of Laser, velocity of ultrasonic waves thickness of a thin wire and Refractive index of a prism • determine the thermal conductivity and Young's modulus of the materials • determine the total hardness of water sample and amount of Ferrous ion , HCl and dissolved oxygen present in given solutions using various methods					
Course Outcomes:	1. Analyze the wavelength of Laser and velocity of ultrasonic waves. 2. Determine the thickness of a thin wire and Refractive index of a prism – light experiments. 3. Determine thermal conductivity of a bad conductor. 4. Experiment with the thermal conductivity and Young's modulus of the materials. 5. Determine the total hardness of unknown water sample. 6. Estimate the amount of Ferrous ion, HCl, dissolved oxygen and copper ion present in given solutions using various methods.					

LIST OF EXPERIMENTS

1. (a) Determination of a particle size using diode laser
   (b) Determination of wavelength of the laser source
   (c) Determination of acceptance angle and numerical aperture of an optical fiber
2. Determination of thickness of thin wire – Air wedge method.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of dispersive power of the prism using spectrometer.
5. Determination of thermal conductivity of a bad conductor by Lee's disc method
6. Determination of Young's Modulus of a Non Uniform Bending material.
7. Estimation of Total hardness of water by EDTA method
8. Estimation of copper in brass by EDTA method
9. Estimation of Ferrous ion by potetiometric titration
10. pH metry –Determination of strength of HCl by NaOH
11. Determination of DO in water (Winkler's Method)

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2	1		1		3	1	1	3	2		2	2
CO2	3	1	1	2	1				3	1	1	3	2		2	1
CO3	2	2	2	1	2				3	1	1	3	2	1	2	2
CO4	1	2	1	2	2				3	1	1	2		2		
CO5	1	2	2	2	2	1	1		3	1	1	1		2		
CO6	2	1	1	1	2		1		3	1	1	1		2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z8	COMPUTER PRACTICE LABORATORY-I		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites/ Corequisites (CR):	12F1Z5 - Computing Fundamentals And 'C' Programming (CR)					
Course Outcomes:	1. Make use of MS-Office packages like, MS-Word, MS-Excel and PowerPoint. 2. Develop flowcharts & algorithms for computing problems. 3. Formulate problems and propose algorithms in C. 4. Analyze program using Conditional and Looping Statements 5. Effectively choose programming components that efficiently compute. 6. Create programs using C language in advance like using structures & pointers.					

LIST OF EXPERIMENTS

1) **Word Processing**

a) Create a word Document using Table creation, Table Formatting and Scientific notations

b) Create Mail Merge

c) Drawing Flowchart for the following

i) To find the largest of three numbers A,B, and C

ii) To find the sum of first 50 Natural numbers

iii) Factorial of given number using Recursion

2) **Spreadsheet**

a) Create Spreadsheet using the following features:

Tables, Charts, Formula, Formula Editor

Sorting, Import/Export Features.

3) **Power-point**

a) Create a Power point Presentation about your college.

"C" Programs

Aim:

To practice C programs for the following concepts:

4) Simple C Programs using Data types, Expression Evaluation
5) Program using Conditional and Looping Statements
6) Program using Arrays
7) Program using functions
8) Program using Switchcase Statement
9) Program using Strings
10) Program using Structures
11) Program using Unions
12) Program using Pointers

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2			2				3	1		1				2
CO2		3		1					3	1	2	1			2	2
CO3	2	1		2	2				3	1	1	1			2	2
CO4	2	1		1	2				3	1	1	1			2	2
CO5		2		1	3				3	1		1			2	2
CO6	1	2		1	1				3	1	2	1			2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F1Z9	ENGINEERING PRACTICES LABORATORY		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	I			
Category:	Core					
Prerequisites:	---					
Course Objectives:	• To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.					
Course Outcomes:	1. Design the pipe connections and identify the various components used in plumbing. 2. Model the simple wooden joints using wood working tools. 3. Create simple lap, butt and tee joints using arc welding equipments. 4. Model the simple components using lathe and drilling machine. 5. Classify the fitting usage of square joint, L joint and stepped joints. 6. Develop the operation of iron box, fluorescent lamp, fan and regulator wiring circuits. 7. Analyze the fundamentals of Boolean algebra and digital logic gates.					

GROUP A CIVIL AND MECHANICAL

I. CIVIL ENGINEERING PRACTICE 9

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe Connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

II. MECHANICAL ENGINEERING PRACTICE 13

Welding:

(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:

(a) Forming and Bending:
(b) Model making – Trays, funnels, etc.
(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B ELECTRICAL AND ELECTRONICS

III ELECTRICAL ENGINEERING PRACTICE 10

1. Residential house wiring using switches, fuse, indicator, lamp and energymeter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power and power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 13

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

REFERENCES

1. K.Jeyachandran, S.Natarajan and S, Balasubramanian, "A Primer on Engineering Practices Laboratory", Anuradha Publications, (2007).
2. T.Jeyapoovan, M.Saravanapandian and S.Pranitha, "Engineering Practices Lab Manual", Vikas Publishing House Pvt.Ltd, (2006)
3. H.S. Bawa, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, (2007).
4. A.Rajendra Prasad and P.M.M.S. Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P.Kannaiah and K.L.Narayana, "Manual on Workshop Practice", Scitech Publications, (1999).

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	3				3	2			2	2		2
CO2	2	2	1	1	3				3		1	1				2
CO3	2	2	1	1	3				3		1	1		2		2

CO4	2	2	3	3	2				3					2		2
CO5	2	2			2				3			1	2	2		2
CO6	2	2	2		1	2			3		1	2	2	3		2
CO7	2	2	2	2	2				3				2	3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2Z1	TECHNICAL ENGLISH - II		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category:	Core					
Prerequisites:	12F1Z1 - Technical English-I					
Aim:	To improve English communication skill with relevance to technical context.					
Course Objectives:	• To show the basic knowledge of English Language for the specific purpose. • To construct written communication skill with mechanics of Writing. • To develop error-free messages. • To infer the meaning of the text to gather information. • To develop Business and technical Communication skill.					
Course Outcomes:	1. Improve reading skill to distinguish different kinds of text. 2. Infer communication module used at workplace. 3. Interpret the text and develop error-free reports. 4. Determine specific information using listening skill. 5. Adapt audience analysis method for an effective mass communication. 6. Evaluate sentence structure and a word.					

UNIT-I READING 12

Intensive reading and predicting content, Reading and interpretation, Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) – Reading comprehension exercises with texts including graphic communication– Exercises in interpreting non-verbal communication-Reading comprehension exercises with critical questions, multiple choice, Reading comprehension exercises with analytical questions on content – Evaluation of content questions.

UNIT-II WRITING 12

Writing a Report-Writing a Proposal-Writing a Feasibility Report-Writing Situational Report- Memo-Writing Agenda –Writing Minutes –Writing Manuals-Writing Thesis statements-Writing Recommendation, Checklist, Instruction-Writing Statement of Purpose-Writing Letter of Recommendation-Writing Statement of the Problem-Transcoding Flow Chart, Pie Chart, Bar Diagram, Line Graph

UNIT-III LISTENING 12

Listening to gather Information- Listening to stories- Listening to a conversations/Interviews Listening to a News Report- Listening to a famous speeches, ceremonial speech, awareness programme and technical presentation- Intensive Listening to find exact information-Listening for gist-Listening to identify expressions used in Discussions-Listening to identify tonal Variations in Speeches

UNIT-IV SPEAKING 12

Talking about General Contents, localities, home town, ambition in life, Future plan-Introducing others-Describing/Introducing function of a product/ machine, talking about pros and cons of the product-Communication for the Mass-Welcome Address, Special Address, Presidential Address, Vote of thanks –Speaking with good Pronunciation-Famous quotes, speeches- Public Speech-Speaking on the General Topic-Appropriate Communication-Answering to the Question, adding valuable points to the discussion, giving an appropriate reply, appropriate vocabulary according to the audience-Giving a specific information about Statistics used in Bar diagram, Pie Chart –Role-Play-Hr and applicant, Purchase Manager and Customer, Industrialist- Reporter, Employer- Employee, Managing Director-HR

UNIT-V FOCUS ON LANGUAGE 12

Synonym-Antonym- Homonym-Tenses-Phrasal Verbs- Acronym- Abbreviations-Foreign words-Confusing Words-Analogy- Numerical Expressions- Purpose Statement- Error Corrections-Direct and Indirect Speech

TOTAL: 60 PERIODS

TEXT BOOK(S)

1. Department of Humanities and Social Sciences, Anna University, '*English for Engineers and Technologists*' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.

REFERENCES

1. Sharan J.Genrson and Steven M.Gerson – "Technical Writing – Process and Product" – Pearson Education – 2000.
2. Raymond V.Lesikar, John D. Pettit and Mary E.Flatley – Lesikass BasicCommunication Tata McGraw Will 8th Edition – 1999.
3. Stevel. E. Pauley, Daniel G.Riordan – Technical Report Writing Today – AITBS Publishing and Distributors, India 5th edition – 2000.
4. Robert L.Shurter, Effective letters in business Third Ed. 1983.
5. Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
6. Cambridge BEC Preliminary 1 : Practice Tests from the University of Cambridge Local Examinations Syndicate, University of Cambridge Local Examinations Syndicate, PB, ISBN: 9780521753012
7. Cambridge BEC Preliminary 2 Student's Book with Answers : Examination papers from University of Cambridge ESOL Examinations, Cambridge ESOL, PB, ISBN: 9780521544504

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				2					2	3		3				
CO2						1		1	3	3	3	3				
CO3						1		1	3	3	2	2				
CO4						1		1	3	3	2	3				
CO5									2	3		3				
CO6				2					2	3	2	2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2Z2	ENGINEERING MATHEMATICS - II		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category:	Core					
Prerequisites:	12F1Z2 - Engineering Mathematics-I					
Aim:	To analyse the engineering problems using the techniques and the mathematical skills acquired by studying vector calculus, Laplace transform, complex variables, ordinary differential equations.					
Course Objectives:	• To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems. • To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines. • To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current. • To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.					
Course Outcomes:	1. Apply Laplace transform to solve first and second order differential equations with elementary forcing function. 2. Classify Green's theorem to evaluate line integrals along simple closed contours on the plane. 3. Construct an analytic function using the properties of analytic function. 4. Make use of Cauchy's residue theorem for applications in Engineering. 5. Evaluate complicated real integrals using the basics of analytic functions and the complex integration. 6. Develop a series solution to an ODE, and analyze special functions defined by series.					

UNIT-I LAPLACE TRANSFORM 12

Laplace transform – Conditions for existence – Transform of elementary functions –Basic properties – Transform of derivatives and integrals – Transform of UNIT step function and impulse functions – Transform of periodic functions. Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques

UNIT-II VECTOR CALCULUS 12

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT-III ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy–Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w = z+c, cz, 1/z, and bilinear transformation.

UNIT-IV COMPLEX INTEGRATION 12

Statement and application of Cauchy's theorem and Cauchy's integral formula, Taylor and Laurent expansion, Singularities, Classification, Residues, Cauchy's residue theorem, Contour integration, UNIT circle and semi-circular contours (excluding poles on real axis).

UNIT-V ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. B.S.Grewal,'Higher Engineering Mathematics', Thirty Sixth Edition,Khanna Publishers, Delhi,2005.
2. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001

REFERENCE(S)

1. Greenberg, M.D. Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman.M.K.,"Engineering Mathematics",Volume I and II Revised enlarged Fourth Edition The National ?Publishing Cpompany,Chennai,2004.
3. Veerarajan.T"Engineering Mathematics",Fourth Edition,Tata McGraw – hill publishing company Ltd,New Delhi,2005.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	1								3	3	2	3	2
CO2	2	2	2	2								2	3	2	3	2
CO3	2	1	2	2								1	3	2	3	2
CO4	1	2	2	3								1	3	2	2	2
CO5	3	3	3	2								2	3	2	3	2
CO6	1	2	2	1								2	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2Z3	ENGINEERING PHYSICS – II		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category:	Core					
Prerequisites:	12F1Z3 - Engineeriong Physics - I					
Aim:	To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.					
Course Objectives:	• To study the theories of conducting and semiconducting materials. • To study the properties and applications of magnetic and super conducting materials. • To understand the properties and applications of dielectric materials and modern engineering materials.					
Course Outcomes:	1. Illustrate the free electron theories (classical and quantum), Fermi Function, carrier concentration in metals. 2. Analyze the theory of conducting and semiconducting materials, Hall Effect and its applications. 3. Classify the properties and applications of magnetic materials and super conducting materials. 4. Summarize the properties of dielectric materials and their applications – Ferro electricity. 5. Analyze the properties and applications of modern engineering materials. 6. Extend the acquaintance of nano phase materials.					

UNIT-I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals

UNIT-II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT-III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT-IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT-V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA.

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.
Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Charles Kittel ' Introduction to Solid State Physics', John Wiley and sons, 7 edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology', Wiley India(2007) (for UNIT V)
3. K.Rajagopal , "Engineering Physics" Prentice Hall of India Pvt.Ltd. New Delhi , 2007

REFERENCE(S)

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New Delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3										3		2		
CO2	3	3	3		2	1						3	2	2	2	
CO3	3	2		3	2	1						3		2		2
CO4	3	3	2		1	1						3		2		
CO5	3	2		3	1	2							2	2	2	2
CO6	3	2	3	3	2	2						3	2	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2Z4	ENGINEERING CHEMISTRY – II		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category:	Core					
Prerequisites:	12F1Z4 - Engineering Chemistry - I					
Aim:	To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.					
Course Objectives:	The student should be conversant with the • Principles electrochemistry, electrochemical cells & applications • Principles of corrosion control • Chemistry of fuels and combustion • Industrial importance of phase rule and alloys • Analytical techniques and their importance					
Course Outcomes:	1. Apply the operating principles and the reactions to electrochemistry. 2. Illustrate the principle and applications of different electrodes with their merits and demerits. 3. Control the corrosion in engineering applications. 4. Illustrate the core concepts behind fuels and combustion. 5. Analyze the concepts of fuel purification processes. 6. Analyze the importance in phase rule and pertain the chemistry of alloys. 7. Interpret the principles, importance and application of analytical techniques.					

UNIT-I ELECTROCHEMISTRY 9

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag^{+} vs CI- titrations) and conduct metric titrations (acid-base – HCI vs, NaOH) titrations

UNIT-II CORROSION AND CORROSION CONTROL 9

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT-III FUELS AND COMBUSTION 9

Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT-IV PHASE RULE AND ALLOYS 9

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT-V ANALYTICAL TECHNIQUES 9

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame

photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co.,New Delhi (2002).
2. Dr.A.Ravikrishnan, "Engineering Chemistry" Sri Krishna Publications, Chennai. (2002)
3. S.S.Dara "A text book of Engineering Chemistry" S.Chand and Co.Ltd., New Delhi (2006).

REFERENCE(S)

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2	1	1								1		2
CO2	3	2	2	2	1	1								1		2
CO3	2	2	1	3	1	3	2	1		2	1	1		2		2
CO4	3	1	2	2	1	2						2		2		2
CO5	2	2	2	3	1	3	2	1			1			2		2
CO6	3	2	2	2	1	2			1	3				2		2
CO7	3	3	3	2	2	3			2	1				2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2X5	ELECTRIC CIRCUITS AND ELECTRON DEVICES		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category:	Core					
Prerequisites/Co requisites (CR):	12F2Z3 - Engineering Physics-II (CR)					
Aim:	To enable the students to develop skills in identifying and testing electronic components and designing circuits using BJT and FET.					
Course Objectives:	To make the students to : • utilize basic analysis laws (Kirchhoff's current law, KCL, Kirchhoff's voltage law, KVL, and Ohm's law) to derive useful relationships for series and parallel combinations of passive and active components • analyze the transient responses of series RC, RL, and RLC circuits • examine the concept of bipolar transistor, FET and its circuit operation • discuss about the different types of diodes and their applications					
Course Outcomes:	1. Adept at using various methods of circuit's analysis, including simplified methods such as series parallel reductions, voltage and current dividers. 2. Appreciate the consequences of linearity, in particular the principle of superposition, Thevenin and Norton equivalent circuits. 3. Analyze the transient responses of RL, RC and RLC circuits. 4. Compare and contrast the characteristics of different solid-state devices and relate them to appropriate applications. 5. Demonstrate the internal workings of the special semiconductor diodes 6. Identify different types of diodes by their schematic symbols.					

UNIT-I CIRCUIT ANALYSIS TECHNIQUES 12

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT-II TRANSIENT RESONANCE IN RLC CIRCUITS 12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT-III SEMICONDUCTOR DIODES 12

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT-IV TRANSISTORS 12

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT-V SPECIAL SEMICONDUCTOR DEVICES (QUALITATIVE TREATMENT ONLY) 12

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,TataMcGraw Hill, (2001)
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices andCircuits",Tata McGraw Hill, 2ndEdition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition(2008).

REFERENCE(S)

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", PearsonEducation, 7th Edition, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6thEdition, 2002.
3. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2ndEdition, 2008.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1		1						2		3		2
CO2	3	3	2	2	1							1		3		2
CO3	3	3	3	2	2							1		3		2
CO4	2	2	2	3	2	2						1		3		2
CO5	3	2	2	3								1		3		2
CO6	3	3	3	2	1	1						1		3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2X6	BASIC CIVIL AND MECHANICAL ENGINEERING		L	T	P	C
			3	1	0	4
Programme:	B.E. (Common to all Circuit Branches)	**Sem:**	II			
Category:	Core					
Prerequisites:	---					
Aim:	To study the basic criteria of Civil and Mechanical Engineering.					
Course Objectives:	• To introduce the concepts of surveying, building materials, components and structures. • To be exposed to the functioning of power plants, pumps and turbines. • To realize the principle and working of IC engines, boilers, Refrigeration and Airconditioning.					
Course Outcomes:	1. Determine the variables in surveying and study building materials. 2. Summarize the building components and structures. 3. Elaborate the concept of superstructure. 4. Examine the working of various power plants, pumps and turbines. 5. Illustrate the functioning of various IC engines and boilers. 6. Design the model of refrigerators and air conditioners.					

A – CIVIL ENGINEERING		
UNIT-I	**SURVEYING AND CIVIL ENGINEERING MATERIALS**	**15**
Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. **Civil Engineering Materials:** Bricks : Properties & uses – Manufacturing, stones:Types, Cement: Manufacturing –Properties-Types of use, concrete: Manufacturing, Sand – steel sections.		
UNIT-II	**BUILDING COMPONENTS AND STRUCTURES**	**15**
Components of Building with typical cross section sketch **Foundations:** Types, Bearing capacity – Requirement of good foundations. **Superstructure:** Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – illustrative examples - Types of Bridges and Dams.		
30 PERIODS		
B – MECHANICAL ENGINEERING		
UNIT-III	**POWER PLANT ENGINEERING**	**10**
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.		
UNIT-IV	**I C ENGINES**	**10**
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.		
UNIT-V	**REFRIGERATION AND AIR CONDITIONING SYSTEM**	**10**
Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.		
30 PERIODS		
		TOTAL: 60 PERIODS

TEXT BOOK

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", TMH Publishing Co., New Delhi (1996)

REFERENCE(S)

1. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).
2. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).
3. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
4. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000)

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assessment Tests (60%)	Assign/Seminar/ Mini project (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			3											2
CO2	3		1		3	2								1		2
CO3	3		2	1										1		2
CO4	3		2	2										2		2
CO5	3		2	2			3							2		2
CO6	3		1		3	2								2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2Z7	PHYSICS & CHEMISTRY LABORATORY - II		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category:	Core					
Prerequisites/ Corequisites (CR):	12F1Z7 - Physics and Chemistry Laboratory – I 12F2Z3 - Engineering Physics-II (CR) 12F2Z4 - Engineering Chemistry-II (CR)					
Aim:	To develop laboratory skills and realization of Physics and chemistry concepts by doing experiments.					
Course Objectives:	The course should enable the students to: • determine the different Modulus, specific resistance, Band gap of the given materials and the coefficient of viscosity of the given liquid • determine the amount of chloride, strong acid, HCl and CH_3COOH and barium chloride present in given sample solutions by various methods • estimate of alkalinity of the water sample					
Course Outcomes:	1. Determine the rigidity modulus and Young's Modulus of the material of a wire. 2. Find the coefficient of viscosity of a liquid. 3. Determine the wavelength of mercury spectrum. 4. Find the specific resistance of a coil of wire and Band gap of a semiconducting material. 5. Determine the amount of chloride, strong acid, HCl and CH_3COOH and barium chloride present in given sample solutions by various methods. 6. Estimate alkalinity of the water sample.					

LIST OF EXPERIMENTS

1. Torsional Pendulum – Determination of rigidity modulus.
2. Determination of Young's modulus of the material – Uniform bending.
3. Determination of Viscosity of liquid – Poiseuille's method.
4. Determination of wavelength of mercury spectrum – Spectrometer Grating.
5. Determination of band gap of semiconducting material.
6. Determination of specific resistance of a given coil of wire – Carey foster bridge.
7. Estimation of chloride content in water sample (Argentometric method)
8. Conductometric titration of strong acid with strong base.
9. Conductometric titration of mixture of acids (HCl & CH_3COOH)
10. Conductometric precipitation titration using $BaCl_2$ Vs Na_2SO_4
11. Estimation of alkalinity in water sample.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2		2					3			2		1		2
CO2	1	2		2					3			2		2		2
CO3	1	3		1					3			2	2	2	2	2
CO4	2	2		2					3			3	2	2		2
CO5	1		2						3			1		2		2
CO6	1								3			2		1		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2Z8	COMPUTER PRACTICE LABORATORY-II		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category:	Core					
Prerequisites:	12F1Z8 - Computer Practice Laboratory - I					
Course Outcomes:	1. Make use of basic UNIX commands and shell scripts. 2. Build simple shell programs. 3. Develop shell scripts using Conditional and Iterative statements. 4. Construct C program using functions. 5. Able to work with File concepts in C. 6. Illustrate file handling in C programming					

LIST OF EXPERIMENTS

1. Study of Unix OS
2. Basic Commands in Unix

Shell Programs

3. Simple Shell Programs
4. Script using for Loop
5. Script using if loop
6. Script using combination of for and if loop
7. Script using while and until loop
8. Script using combination of while and if loop
9. Script using Switch case
10. String Manipulation
11. File manipulation

C-Programs

1. Function with no arguments and no return type
2. Function with no arguments and return type
3. Function with arguments and no return type
4. Function with arguments and return type
5. Call by value
6. Call by reference
7. Recursion function
8. Pointers
9. Random access functions in files
10. File handling

SYLLABUS

2. UNIX COMMANDS

Study of UNIX OS – Basic Shell Commands – Unix Editor.

3. SHELL PROGRAMMING

Simple Shell program – Conditional Statements – Testing and Loops.

4. **C PROGRAMMING ON UNIX**

Dynamic Storage Allocation-Pointers-Functions-File Handling.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1					3	1		1			1	2
CO2	2	3	1	2	2	2			3	1		2	1		2	2
CO3	2	3	2	2		1			3	1		2	1		2	2
CO4	2	2	2	2	3	2			3	1		2	1		2	2
CO5	2	2	2			1			3	1		1	1		1	2
CO6	2	2	3	2	3				3	1		1			1	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12F2X8	**ELECTRIC CIRCUITS AND ELECTRON DEVICES LABORATORY**		**L**	**T**	**P**	**C**
			0	**0**	**3**	**2**
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	II			
Category	Core					
Prerequisites/ Corequisites (CR):	12F2X5 - Electric Circuits and Electron devices (CR)					
Aim:	Enable the students to design circuits using diodes, BJT and FET.					
Course Objectives:	To make the students to: • explain how current flows through the p-n junction and relating this phenomena to the characteristics and operation of the diodes, bipolar and field-effect transistors • expose students to the function and application of the diodes, bipolar junction and field effect transistors in electronic circuits					
Course Outcomes:	1. Verify in practice some important circuit Theorems and concepts, such as Thevenin superposition, Norton's and maximum power transform. 2. Analyze linear D.C circuit using ohm's law, Kirchhoff's voltage law & Kirchhoff's current law. 3. Analyze steady state linear A.C circuit containing dependent & independent sources, resistor, capacitor & inductors. 4. Analyze the characteristics of various diodes. 5. Design different types of biasing circuits of transistor & FET. 6. Illustrate the capabilities & limitation of UJT, SCR, TRIAC and DIAC and decide their best utilization in a specific situation.					

LIST OF EXPERIMENTS

1.Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems
3. Verification of superposition Theorem
4. Verification of Maximum power transfer and reciprocity theorems
5. Frequency response of series and parallel resonance circuits
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac
12. Characteristics of Photodiode and Phototransistor

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]

Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3					3	1	1	1	3	3		2
CO2	3	3	3	3	1				3	1	1	1	3	3		2
CO3	3	3	2	3	1	1			3	1	1	1	3	3		2
CO4	3	2	2	3	2	1			3	1	1	2	3	2		2
CO5	3	2	3	3	2	2			3	1	2	2	3	3		2
CO6	3	2	3	3	2	2			3	1	1	2	3	3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12MA31	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATION		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	III			
Category	Core					
Prerequisites:	12F2Z2 - Engineering Mathematics II					
Aim:	The course is aimed at developing the basic mathematical skills of Engineering students.					
Course Objectives:	• The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. • This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. • The course will also serve as a prerequisite for post graduate and specialized studies and research. • This will be necessary for their effective studies in Applied Electronics, Design Engineering. • Transforms and PDE is problem solving techniques for engineers and scientists.					
Course Outcomes:	1. Classify the Fourier series and half range Fourier sine and cosine series. 2. Clarify the Fourier transform with their properties. 3. Determine Z-inverse transform using convolution theorem and partial fraction method. 4. Solve the partial differential equation by using Lagrange's linear equation. 5. Analyze separation of variable to solve linear partial differential equation. 6. Illustrate the formation of partial differential equation.					

UNIT-I FOURIER SERIES 12

Dirichlet's Conditions – General Fourier Series –Odd and even functions- Half range Sine and Cosine series – Complex form of Fourier Series - Parseval's Identity – Harmonic Analysis.

UNIT-II FOURIER TRANSFORMS 12

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT-III PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT-IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT-V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties– Inverse Z-transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z-transform.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. Grewal, B.S, "Higher Engineering Mathematics", 40th Edition, Khanna publishers, Delhi, (2007)
2. Veerarajan, T., "Transforms and Partial Differential Equation", Tata Mc-GrawHill Publishing Company limited, New Delhi (2011).

REFERENCE(S)

1. Bali, N.P and Manish Goyal "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007)
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd edition-Pearson Education (2007)
4. Erwin Kreyszig "Advanced Engineering Mathematics", 8th edition-Wiley India (2007)

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3								2	2	2	3	2
CO2	2	3	2	3								2	2		3	1
CO3	3	2	2	3	1							2	2	2	3	2
CO4	3	3	2	2	1							2	2		3	2
CO5	3	2	2	2	1							2	2		3	2
CO6	2	2	2	2	1							2	2		3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC31	ELECTRONIC CIRCUITS I		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category :	Core					
Prerequisites:	12F2X5 - Electric Circuits And Electron Devices					
Aim:	Analyze and design of basic transistor amplifier circuits and power supplies.					
Course Objectives:	To make the students to: • explain the methods of biasing transistors • compute the Midband analysis of amplifier circuits using small - signal equivalent circuits to determine gain input impedance and output impedance • derive the method of calculating cutoff frequencies and to determine bandwidth • examine the operation of filters and the design of power supplies					
Course Outcomes:	1. Design and analyze the bias circuit of BJT and FET for a given specification. 2. Analyze the single stage amplifiers and derive the parameters. 3. Design the BJT and FET amplifiers to obtain the upper and lower cutoff frequency. 4. Obtain the efficiency of different power amplifiers. 5. Clarify the different types of amplifiers, filters. 6. Analyze the principle of regulator power supplies.					

UNIT-I TRANSISTOR BIAS STABILITY 12

BJT – Need for biasing – Stability factor - Fixed bias circuit, Load line and quiescentpoint. Variation of quiescent point due to *FE h* variation within manufacturers tolerance -Stability factors - Different types of biasing circuits - Method of stabilizing the Q point -Advantage of Self bias (voltage divider bias) over other types of biasing, Bias compensation – Diode, Thermister and Sensistor compensations, Biasing the FET and MOSFET.

UNIT-II MIDBAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS 12

CE, CB and CC amplifiers - Method of drawing small-signal equivalent circuit –Midband analysis of various types of single stage amplifiers to obtain gain, input impedance andoutput impedance - Miller's theorem - Comparison of CB, CE and CC amplifiers andtheir uses - Methods of increasing input impedance using Darlington connection andbootstrapping - CS, CG and CD (FET) amplifiers - Multistage amplifiers.Basic emitter coupled differential amplifier circuit - Bisection theorem. Differential gain –CMRR - Use of constant current circuit to improve CMRR - Derivation of transfer characteristic.

UNIT-III FREQUENCY RESPONSE OF AMPLIFIERS 12

General shape of frequency response of amplifiers - Definition of cutoff frequencies and bandwidth - Low frequency analysis of amplifiers to obtain lower cutoff frequency Hybrid– π equivalent circuit of BJTs - High frequency analysis of BJT amplifiers to obtain upper cutoff frequency – Gain Bandwidth Product - High frequency equivalent circuit ofFETs - High frequency analysis of FET amplifiers - Gain-bandwidth product of FETs -General expression for frequency response of multistage amplifiers - Calculation ofoverall upper and lower cutoff frequencies of multistage amplifiers - Amplifier rise timeand sag and their relation to cutoff frequencies.

UNIT-IV LARGE SIGNAL AMPLIFIERS 12

Classification of amplifiers, Class A large signal amplifiers, second harmonic distortion, higher order harmonic distortion, transformer-coupled class A audio power amplifier –efficiency of Class A amplifiers. Class B amplifier – efficiency - push-pull amplifier -distortion in amplifiers

- complementary-symmetry (Class B) push-pull amplifier, Class C, Class D amplifier – Class S amplifier – MOSFET power amplifier, Thermal stability and heat sink.

UNIT-V RECTIFIERS AND POWER SUPPLIES 12

Classification of power supplies, Rectifiers - Half-wave, full-wave and bridge rectifierswith resistive load. Analysis for *dc V* and ripple voltage with C, L, LC and CLC filters. Voltage multipliers, Voltage regulators - Zener diode regulator, principles of obtaining aregulated power supply, regulator with current limiting, Over voltage protection, Switchedmode power supply (SMPS), Power control using SCR.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. Millman J and Halkias .C., Integrated Electronics, TMH, 2007.
2. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007.

REFERENCE(S)

1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9th Edition, Pearson Education / PHI, 2007.
2. David A. Bell, Electronic Devices & Circuits, 4th Ediion, PHI, 2007
3. Floyd, Electronic Devices, Sixth Edition, Pearson Education, 2002.
4. I.J. Nagrath, Electronic Devices and Circuits, PHI, 2007.
5. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.
6. B.P. Singh and Rekha Singh, Electronic Devices and Integrated Circuits, PearsonEducation, 2006.
7.Rashid M, Microelectronics Circuits, Thomson Learning, 2007

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2		1						1		3	3	1
CO2	3	3	2	2	1	1			2	1	1	1		3	2	1
CO3	3	3	2	2	1	2						1		3	3	1
CO4	3	3	2	2		2						1		3	3	2
CO5	3	3	2	2	1	2						1		3	3	1
CO6	2	2	3	3		1						1		3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC32	DIGITAL LOGIC TECHNIQUES AND CIRCUITS		L	T	P	C
			3	1	0	4
Programme:	B.E Electronics and Communication Engineering	**Sem:**	III			
Category:	Core					
Prerequisites:	12F1Z5 - Computing Fundamentals and C Programming 12F2X5 - Electric Circuits and Electron Devices					
Aim:	To facilitate the students to design digital circuits and systems using hardware and VHDL.					
Course Objectives:	The course objectives are to make the students to: • define the basic postulates of Boolean algebra • analysis and design of combinational circuits and sequential circuits • develop the programming skill in VHDL					
Course Outcomes:	1. Summarize the number systems. 2. Minimize functions using any type of minimizing algorithms (Boolean algebra, Karnaugh map or Tabulation method). 3. Design, simulate, build and debug complex Combinational and sequential circuits based on an abstract functional specification. 4. Analyze & design circuits with Flip-Flops, Counters and Registers. 5. Make use of Xilinx software to write programs in Hardware Description Language for combinational circuits & Sequential Circuits. 6. Determine the types of memory devices.					

UNIT-I MINIMIZATION TECHNIQUES 12

Number system - Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic – 1's complement and 2's complement representation, addition and subtraction. Classification of binary Codes, BCD (8-4-2-1) code, Excess-3 code, Gray code, advantages of Gray code, Gray to binary and binary to gray conversions.

Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization.

UNIT-II LOGIC GATES & COMBINATIONAL CIRCUITS 12

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR- Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations. TTL and CMOS Logic circuits.

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor - Parallel binary adder, Parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider – Multiplexer / Demultiplexer – Decoder / Encoder – Parity checker – Parity generators - Code converters - Magnitude Comparator. Design of Combinational circuits using VHDL.

UNIT-III SEQUENTIAL CIRCUITS 12

Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops.

Counters - Asynchronous Ripple or serial counter –Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters - Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter.

Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT-IV SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 12

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines.

Problems in Asynchronous Circuits –Cycles, Races, Hazards - Design of Hazard Free Switching circuits. Design of Sequential circuits using VHDL.

UNIT-V MEMORY DEVICES 12

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization - Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Memory decoding – Memory expansion.

Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2007.
2. Donald P.Leach , Albert Paul Malvino , Goutam Shah "Digital principles & applications",7th edition, 2011

REFERENCE(S)

1. Donald D.Givone, Digital Principles and Design, TMH, 2003.
2. M.Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assessment Tests (60%)	Assignment/Seminar (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [MinPass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3								1	1	3	1	2
CO2	3	3	3	3	2							3	1	3	1	2
CO3	3	3	3	3	2	2						3	2	3		2
CO4	3	3	3	3	2	1	1					3	2	3	1	2
CO5	3	3	3	3	2	1						3	2	3	1	2
CO6	3	1	2	2	2							2	2	3	1	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC33	NETWORKS AND TRANSMISSION LINES		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	III			
Category	Core					
Prerequisites:	12F2Z2 - Engineering Mathematics II					
Aim:	To study and analyze the Networks and Transmission line parameters.					
Course Objectives:	• To study the two port networks and its parameters. • To design, analyze and synthesize various filters and attenuators. • To study and design transmission line and analyze the parameters.					
Course Outcomes:	1. Estimate the model of two port networks and its parameters. 2. Examine the prototype for m-derived filters and attenuators using T and π sections. 3. Analyze the performance of lumped filters. 4. Determine the driving point impedance through Positive Real Function for network synthesis. 5. Design the Foster and Cauer forms of RC, LC and RL networks. 6. Examine the general solutions of transmission line Theory (E and I). 7. Identify various parameters of transmission lines using smith chart.					

UNIT-I SYMMETRICAL AND ASYMMETRICAL TWO PORT NETWORKS 9

Two port networks- Characterization in terms of impedance, Admittance, Hybrid and Transmission parameters - Inter relationships among parameter sets - Interconnection of two port networks - Series, parallel and cascade. Lattice Networks-Symmetrical two port networks: T and π Equivalent of a two port network - Image impedance - Characteristic impedance and propagation constant of a symmetrical two port network.

UNIT-II LUMPED FILTERS 9

The neper - the decibel - Current and voltage ratios - Propagation constant, - Filter fundamentals – Pass and Stop bands. Behaviour of the Characteristic impedance. Constant K Filters - Low pass, High pass band, pass band elimination filters - m - derived sections – Filter circuit design – Filter performance – Crystal Filters. Symmetrical and asymmetrical attenuators - T and π sections.

UNIT-III PASSIVE NETWORK SYNTHESIS 9

Synthesis: Positive real functions - Driving point functions - Brune's positive real functions - Properties of positive real functions. Testing driving point functions - Application of maximum modulus theorem - Properties of Hurwitz polynomials -Even and odd functions - Strum's theorem - Driving point synthesis - RC elementary synthesis operations - LC network synthesis - Properties of RC network functions - Foster and Cauer forms of RC and RL networks.

UNIT-IV TRANSMISSION LINE THEORY 9

A Line of cascaded T sections – Transmission lines – General Solutions , Physical Significance of the equations, The infinite line, Wavelength, Velocity of Propagation, Distortionless line, The telephone cable, Reflection on a line not terminated in Z_0, Reflection Coefficient, Open and Short Circuited Lines, Insertion loss.

UNIT-V LINE AT RADIO FREQUENCIES 9

Parameters of open wire line and co-axial line at high frequencies-Standing waves-Standing wave ratio-Input impedance of open and short circuited lines-Relation between VSWR and

reflection co-efficient-Quarter wave transformer-Single and double stub matching-Smith chart and its applications.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. John.D.Ryder "Network lines and fields", Prentice Hall of India Pvt. ltd, 2nd Edition 1997.
2. Sudhahar.A, Shyammohan S.P, "Circuits and Networks: Analysis and Synthesis", TataMcGraw Hill, New Delhi, 3rd edition 2007.

REFERENCE(S)

1. Umesh Sinha "Network analysis and Synthesis", Sathya Prakashan Publishers, 1997.
2. Van Valkenburg "Introduction to modern Synthesis", Wiley Eastern Publication, 2007.
3. B.P Lathi, "Linear Systems and Signals", Oxford University Press, 2nd Edition, 2009.
4. D. Roy Choudhary, "Network and Systems", New Academic Science, 2nd Edition, 2009.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2							1	2	2		2
CO2	3	3	2	2	2							1	2	2		2
CO3	2	2	2	2	3							1	2	2	2	2
CO4	2	3	1	1	1							1	3	2		2
CO5	2	3	3	3	1				2	1	2	1	3	3		2
CO6	3	2	2	1	1	1	2					1	3	2		2
CO7	2	3	3	2	3							1	2	1	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC34	DATA STRUCTURES AND C++		L	T	P	C
			3	0	0	3
Programme:	B.E Electronics and Communication Engineering	**Sem:**	III			
Category:	Core					
Prerequisites:	12F1Z5 - Computing Fundamentals and C Programming					
Aim:	To provide an in-depth knowledge in object oriented programming and data structures.					
Course Objectives:	• To learn the systematic way of solving problems. • To understand the different methods of organizing large amounts of data. • To learn to program in C++. • To efficiently implement the different data structures.					
Course Outcomes:	1. Clarify the fundamental principles of object oriented programming. 2. Design and write well organized C++ programs incorporating object-oriented techniques such as constructor, polymorphism and reusability. 3. Exemplify and implement abstract data types such as stack, queue and linked list for memory management. 4. Distinguish the conceptual and applicative differences in trees, binary trees and binary search trees. 5. Model, solve and develop code for real life problems like shortest path, network flow and minimum spanning using graph theory. 6. Develop and compare the sorting algorithms. 7. Design, develop, test and debug in C++ language considering appropriate algorithm.					

UNIT-I PRINCIPLES OF OBJECT ORIENTED PROGRAMMING 9

Introduction- Tokens-Expressions-control Structures –Functions in C++, classes and objects, constructors and destructors, operators overloading and type conversions.

UNIT-II ADVANCED OBJECT ORIENTED PROGRAMMING 9

Inheritance, Extending classes, Pointers, Virtual functions and polymorphism, Templates, Exception handling, Manipulating strings.

UNIT-III DATA STRUCTURES & ALGORITHMS 9

Algorithm, Analysis, Lists, Stacks and queues, Priority queues-Binary Heap- Application, Heaps- hashing-hash tables without linked lists

UNIT-IV NONLINEAR DATA STRUCTURES 9

Trees-Binary trees, search tree ADT, AVL trees, Graph Algorithms- Topological sort, shortest path algorithm network flow problems-minimum spanning tree.

UNIT-V SORTING AND SEARCHING 9

Sorting – Insertion sort, Shell sort, Heap sort, Merge sort, Quick sort, Indirect sorting, Bucket sort, Introduction to Algorithm Design Techniques –Greedy algorithm, Divide and Conquer, Dynamic Programming.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 3rd ed, Pearson Education Asia, 2007.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Company Ltd., 2007.

REFERENCE(S)

1. Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition, 2007.
2. Sahni, "Data Structures Using C++", The McGraw-Hill, 2006.
3. Seymour, "Data Structures", The McGraw-Hill, 2007.
4. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002.
5. John R.Hubbard, Schaum's outline of theory and problem of data structure with C++, McGraw-Hill, New Delhi, 2000.
6. BjarneStroustrup, The C++ Programming Language, Addison Wesley, 2000
7. Robert Lafore, Object oriented programming in C++, Galgotia Publication.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assessment Tests (60%)	Assignment/Seminar (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [MinPass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								3			2	3
CO2	3	3	3	3	2	2			2	2	2	2			2	3
CO3	3	2	3	3	1							2			2	3
CO4	3	3	2	2	1							2			2	3
CO5	3	2	3	2	2	2			2	2	2	2			2	3
CO6	3	3	3	2	2	1			2	2	1	2			2	3
CO7	3	2	3	3	2	1			2	2	2	2			2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC35	ELECTRICAL ENGINEERING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category :	Core					
Prerequisites:	12F2Z2 - Engineering Mathematics-II 12F2Z3 - Engineering Physics-II					
Aim:	To expose the students to the concepts of various types of electrical machines and transmission and distribution of electrical power.					
Course Objectives:	• To impart knowledge on Constructional details, principle of operation, performance of Starters and testing of D.C. machines. • Transformers. • Induction motors. • Alternators and special machines. • Power System transmission and distribution.					
Course Outcomes:	1. Clarify the construction and principle of DC Machines. 2. Analyze the performance of the machines and control the speed of the given DC shunt motor by field and armature control method. 3. Classify the types of transformer and also develop EMF equation. 4. Illustrate the synchronous machine operation with their phasor diagram. 5. Able to analyze various induction machines and its speed control characteristics. 6. Examine various types of special electrical machines.					

UNIT-I DC MACHINES 9

DC Generator - Construction-Working principle-Armature reaction-Commutation-EMF equation-Electrical characteristics-Applications- DC Motors-Back EMF -Torque equation-Performance characteristics-Starters-tests-Speed control-Applications.

UNIT-II TRANSFORMERS 9

Single phase construction- Working principle - EMF equation - Types - Phasor diagram-Equivalent circuit -All day efficiency - Auto transformers - Three phase-Construction- Star and Delta connections.

UNIT-III SYNCHRONOUS MACHINES 9

Alternators – Construction - Principle of operation – EMF equation - Phasor diagram - Regulation-Synchronous motor - Power relation - Effect of excitation - phasor diagram - V and inverted V curves - Hunting-Starting methods - Applications.

UNIT-IV INDUCTION MACHINES 9

Three phase – Construction - Working principle – Speed - torque curve - Starting-Speed control - Single phase-Principle of operation-Types-Applications.

UNIT-V SPECIAL MACHINES 9

Stepper motor-DC and AC servomotors-AC series motor-Universal motor-Printed circuit (Disc) DC motor-Reluctance motor-Hysteresis motor-Linear induction motor.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. J.B.Gupta, “Theory and Performance of Electrical machines”, S.K.Kataria& Sons, NewDelhi 2009.
2. B.L.Theraja, “A Text Book of Electrical Technology”, Volume II, (AC & DC Machines), S.Chand& Company Ltd, New Delhi, 2004.

REFERENCE(S)

1. M.N.Bandyopadhyay, “Electrical Machines-Theory and Practice” PHI Learning, 3rd Ed. 2011.
2. Alexander Langsdorf, “Theory of DC Machinery”, PHI, 1975.

3. Alexander S.Langsdorf, “Theory of Alternating-Current Machinery”, PHI, 1985.
4. I.J.Nagrath, D.P.Kothari, “Electric Machines”, TMH, 2003.
5. B.R.Sharma, “Electrical Machines”, satyaPrakashan Publication, 2000.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1		1						1		3		2
CO2	3	2	2	1		1						1		3	2	2
CO3	3	2	2			1						1	2	3	2	2
CO4	3	2	2			1								3		2
CO5	3	2	2			1						1		3	2	2
CO6	2	2	1	1								1		3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC36	ELECTRONIC CIRCUITS-I LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	III			
Category :	Core					
Prerequisites/Co requisites (CR):	12F2X5 - Electric Circuits and Electron Devices Lab 12EC31 - Electronic Circuits I (CR)					
Aim:	To make the students design transistor amplifier circuits and power supplies.					
Course Objectives :	The course objectives are to adapt the students to : • design biasing circuits for transistors • design different power amplifier circuits • analyze and design different power supply circuits					
Course Outcomes :	1. Analyze the BJT and FET circuits using different biasing conditions. 2. Compute frequency responses of the transistor and FET amplifier circuits. 3. Design and analyze the multistage amplifier circuits. 4. Analyze and construct differential amplifier circuit and evaluate the value of CMRR. 5. Design and analyze the class A and class B power amplifier and also calculate its efficiency. 6. Design and analyze the full wave and half wave rectifier with simple capacitor filter.					

LIST OF EXPERIMENTS

Expt No.1 Fixed Bias amplifier circuit using BJT

1. Waveforms at input and output without bias.
2. Determination of bias resistance to locate Q-point at center of load line.
3. Measurement of gain.
4. Plot the frequency response & Determination of Gain Bandwidth Product

Expt No.2 Design and construct BJT Common Emitter Amplifier using voltagedivider bias (self-bias) with and without bypassed emitter resistor.

1. Measurement of gain.
2. Plot the frequency response & Determination of Gain Bandwidth Product

Expt No.3 Design and construct BJT Common Collector Amplifier using voltagedivider bias (self-bias).

1. Measurement of gain.
2. Plot the frequency response & Determination of Gain Bandwidth Product

Expt No.4 Darlington Amplifier using BJT.

1. Measurement of gain and input resistance. Comparison with calculated values.
2. Plot the frequency response & Determination of Gain Bandwidth Product

Expt No.5 Source follower with Bootstrapped gate resistance

1. Measurement of gain, input resistance and output resistance with and withoutBootstrapping. Comparison with calculated values.

Expt No.6 Differential amplifier using BJT

1. Measurement of CMRR.

Expt No.7 Class A Power Amplifier
1. Observation of output waveform.
2. Measurement of maximum power output.
3. Determination of efficiency.
4. Comparison with calculated values.

Expt No.8 Class B Complementary symmetry power amplifier
1. Observation of the output waveform with crossover Distortion.
2. Modification of the circuit to avoid crossover distortion.
3. Measurement of maximum power output.
4. Determination of efficiency.
5. Comparison with calculated values.

Expt No.9 Power Supply circuit - Half wave rectifier with simple capacitor filter.
1. Measurement of DC voltage under load and ripple factor, Comparison withcalculated values.
2. Plot the Load regulation characteristics using Zener diode.

Expt No.10 Power Supply circuit - Full wave rectifier with simple capacitor filter
1. Measurement of DC voltage under load and ripple factor, Comparison with calculated values.
2. Measurement of load regulation characteristics. Comparison with calculated values.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2					3	2		2	1	3	1	2
CO2	3	3	3	2					3	2	2	2	2	3	2	2
CO3	3	3	3	2					3	2		2	2	3	2	2
CO4	3	3	3	2					3	2		2	3	3	2	2
CO5	3	3	3	2					3	2	2	2	3	3	2	2
CO6	3	3	3	2					3	2	2	2	2	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC37	DIGITAL LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	III			
Category :	Core					
Prerequisites/Co requisites (CR):	12F1Z5 - Computing Fundamentals and C Programming 12EC32 - Digital logic techniques and Circuits (CR)					
Aim:	To analyze the digital circuit design using logic gates and simulation using VHDL.					
Course Objectives:	To make the students to : • design and implementation of basic logic gates • estimate the multiplexer, code convertor and magnitude comparator • simulation of combinational and sequential circuit using VHDL language					
Course Outcomes :	1. Construct Circuits to verify the Boolean laws. 2. Design adder, subtractor and magnitude comparator circuits using logic gates. 3. Analyze and build multiplexer, demultiplexer,encoder and decoder 4. Construct and analyze Multiplexer, Demultiplexer, Encoder and Decoder circuits. 5. Design flip flops, shift register and counters using HDL. 6. Make use of Hardware Description Language – Verilog Hardware Description Language to design adders, subtractors, multiplexers and demultiplexers.					

LIST OF EXPERIMENTS

Experiments on Combinational Circuits

1. Verification of Boolean laws & Code Converters.
2. Binary adder &Subtractor using logic gates and MSI devices.
3. Magnitude Comparator.
4. Multiplexer and Demultiplexer.
5. Encoder and Decoder.

Experiments using Hardware Description Language

6. Design of flipflops using gates and asynchronous counter.
7. Shift register (SISO,SIPO,PIPO,PISO)
8. Synchoronous up/down counters.
9. Adders, Subtractors, Multiplexer and Demultiplexer.

Experiments using Verilog Hardware Description Language

10. Code Converters.
11. Shift registers.
12. Synchoronous Binary Counters.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3					3	1		1		3	3	2
CO2	3	3	3	3	1				3	1	2	1	2	3	2	2
CO3	3	3	3	3	1				3	1		1		3		3
CO4	3	3	3	3	1				3	1	2	1		3		2
CO5	3	3	3	3	3	1			3	1	2	1	3	3	1	2
CO6	3	3	3	3	3	1			3	1	2	2	2	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC38	DATA STRUCTURES AND C++ LABORATORY		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	III			
Category :	Core					
Prerequisites/Co requisites (CR):	12F2Z8 - Computer Practice Laboratory – II 12EC34 - Datastructures and C++ (CR)					
Aim:	To develop skills in design and implementation of data structures and their applications.					
Course Outcomes :	1. Develop basic C++ programs for object oriented programming concepts. 2. Develop and analyze C++ programs for List ADT, Stack ADT and Queue ADT using array data structures. 3. Experiment with C++ class for List ADT using dynamic memory allocation and cursors. 4. Develop and analyze C++ programs for Stack ADT and Queue ADT using Linked List data structures. 5. Develop C++ programs using array and Linked List data structures. 6. Create Binary search tree using c++ classes. 7. Design and Develop C++ programs for Heap sort, Merge Sort and Quick Sort.					

LIST OF EXPERIMENTS

1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. The next two exercises are to be done by implementing the following source files
   (a) Program source files for Stack Application 1
   (b) Array implementation of Stack ADT
   (c) Linked list implementation of Stack ADT
   (d) Program source files for Stack Application 2
7. Queue ADT – Array and linked list implementations
8. Search Tree ADT - Binary Search Tree
9. Heap Sort
10. Quick Sort

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2					3	1	1	2	2		2	2
CO2	3	3	3	2					3	1	1	2	2		2	2
CO3	3	3	2	1					3	1		2	2		2	2
CO4	2	3	3						3	1	1	2	2		2	2
CO5	3	2	3						3	1		2	2		2	2
CO6	3	2	2	2					3	1	2	2	2		2	2
CO7	3	3	3						3	1	1	2	2		2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12HS31	PROFESSIONAL ENGLISH-I		L	T	P	C
			0	0	1	1
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	III			
Category:	Core					
Prerequisites:	12F2Z2 - Technical English - II					
Aim:	To create an Environment to improve learner's communication skill using Professional English module.					
Course Objectives:	• To impart basics of Language & Grammar relating to Business Communication. • To imbibe the spirit of accurate and appropriate Basic communication. • To introduce the professional Communication module. • To improve learners ability to understand Technical communication					
Course Outcomes:	1. Employ appropriate syntax and words. 2. Develop the text and its structure to respond any queries. 3. Improve technical communication. 4. Respond oral communication at work place. 5. Improve learners ability to understand talks and lectures on technical subjects 6. Develop coherence in oral presentation and Initiate discussion with the mass.					

A. Language & Grammar **2**

1. Use of Verb,Article,Adjectives,Adverbs,Preposition,Conjunction,Comparative Superlative
2. Noun –Antecedent & Precedent
3. Spelling &Punctuation
4. Concord
5. Use of Active & Passive voice
6. Use of Conditional Sentence & Reported speech

B. Reading **4**

1. Reading technical reports for Gist
2. Reading Technical Article, Graphs, Charts, Adverts, Notices & Proposals for Structure and detail

C. Writing **3**

1. Writing E-mails for giving Instruction/ Summarizing/Persuading/Giving assurance/asking a comment
2. Writing an Introduction to Report/Proposal/Technical Description
3. Writing Instructions & Recommendations for User manuals/Equipments/devices/New Inventions

D. Listening **3**

1. Listening to Technical News for Gist
2. Listening to Technical Interviews for gathering information
3. Listening to a Presentation for inferring meaning

E. Speaking **6**

1. Self-Introduction
2. Have your say- Recent gadgets/Technical Innovations/ Scientific Inventions

TOTAL: 18 PERIODS

TEXT BOOK(S)

1. Technical Writing: Process and Product, Gerson, Pearson Education India, 2007 ISBN: 8131709280, 9788131709283
2. Business Benchmark Pre-Intermediate to Intermediate: Student's Book BEC Preliminary Edition, Norman Whitby, PB + 2 Audio CDs, ISBN: 9780521759397

Examination Guideline

Internal and External Examinations should be considered only from The BUSINESS ENGLISH oriented Articles/Extracts/Clips/Illustrations/Audio scripts.

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1						1	1			3	1	2				
CO2						1	1			3	1	2				
CO3						2	2		3	3	1	2				
CO4						1	1	1		3	1	2				
CO5						2	2	1	3	3	1	2				
CO6						2	2	1	3	3	1	2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12MA43	PROBABILITY AND RANDOM PROCESSES		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites:	12MA31 - Transforms and Partial Differential Equations					
Aim:	This course aims at providing the necessary basic concepts in random processes. Knowledge of fundamentals and applications of random phenomena will greatly help in the understanding of topics such as signals & systems, pattern recognition, voice and image processing and filtering theory.					
Course Objectives:	• Have a fundamental knowledge of the basic probability concepts. • Have a well-founded knowledge of standard distributions which can describe real life phenomena. • Acquire skills in handling situations involving more than one random variable and functions of random variables. • Understand and characterize phenomena which evolve with respect to time in Probabilistic manner. • Be able to analyze the response of random inputs to linear time invariant systems.					
Course Outcomes:	1. Classify the discrete and continuous random variables. 2. Determine strictly stationary, wide–sense stationary and ergodic processes. 3. Apply linear time invariant system and system transfer function. 4. Analyze central limit theorem. 5. Examine wiener-khintchine relation. 6. Analyse the binomial, poisson, geometric, Uniform, exponential, gamma and normal distribution.					

UNIT-I RANDOM VARIABLES 12

Discrete and continuous random variables - Moments - Moment generating functions and their properties. Binomial, Poisson ,Geometric, Uniform, Exponential, Gamma and normal distributions - Function of Random Variable.

UNIT-II TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem (for iid random variables)

UNIT-III CLASSIFICATION OF RANDOM PROCESSES 12

Definition and examples - first order, second order, strictly stationary, wide-sense stationary and ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process - Random telegraph process.

UNIT-IV CORRELATION AND SPECTRAL DENSITIES 12

Auto correlation - Cross correlation - Properties - Power spectral density - Cross spectral density - Properties - Wiener-Khintchine relation - Relationship between cross power spectrum and cross correlation function

UNIT-V LINEAR SYSTEMS WITH RANDOM INPUTS 12

Linear time invariant system - System transfer function - Linear systems with random inputs - Auto correlation and cross correlation functions of input and output - white noise.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", Elsevier, First Indian Reprint (2007) (For UNITs 1 and 2)
2. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002.(For UNITs 3, 4 and 5).Ram nagar, New Delhi.

REFERENCE(S)

1. Miller,S.L and Childers,S.L, "Probability and Random Processes with applications to Signal Processing and Communications, Elsevier Ine., First.Indian Reprint 2007.
2. H. Stark and J.W. Woods, "Probability and Random Processes with Applications to Signal Processing", Pearson Education (Asia), 3rd Edition, 2002.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw-Hill edition, New Delhi, 2004.
4. Leon-Garcia,A, "Probability and Random Processes for Electrical Engineering",Pearson Education Asia, Second Edition, 2007.
5. Yates & D.J.Goodman,"Probability & Stochastic Processes", John Wiley and son Second edition , 2005.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3								3	2		3	2
CO2	3	2	3	2								2	2		3	2
CO3	2	2	2	2								2	2		3	2
CO4	2	2	2	3								1	2	2	3	2
CO5	2	2	3	2								2	2	2	3	2
CO6	3	3	2	2								3	2		3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC41	ELECTRONIC CIRCUITS-II & MICROPROCESSOR		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category :	Core					
Prerequisites:	12EC31 - Electronics Circuits-I					
Aim:	To make the student design and analyze feedback amplifiers, oscillators, tuned amplifiers, wave shaping circuits, multivibrators and microprocessor.					
Course Objectives:	To adapt the students to: • analyze the feedback amplifiers and discuss about the advantages • design and analyze LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators and blocking oscillators • infer architecture, programming and interfacing of 8085 with peripheral devices					
Course Outcomes:	1. Analyze the various types of oscillators and determine the stability of feedback amplifiers. 2. Examine the characteristics of various large signal amplifiers and design single tuned and double tuned amplifiers. 3. Design non linear wave shaping circuits like clippers, clampers and multivibrators. 4. Demonstrate the various pins, instruction sets and various addressing modes of 8085. 5. Develop assembly language program for arithmetic and logical operations. 6. Explore techniques for interfacing I/O devices to 8085 microprocessor including several specific standard I/O devices such as 8251, 8237 and 8255.					

UNIT-I FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Types of feedback amplifiers - Analysis of voltage and current feedback amplifiers – Oscillators - Barkhausen criterion - Design of Oscillators - Colpitts oscillator, Hartley oscillator, RC Phase Shift Oscillator, Wein Bridge oscillator and Crystal Oscillators.

UNIT-II LARGE SIGNAL AND TUNED AMPLIFIERS 9

Classification of large signal amplifiers - Class A, B, C, D and AB amplifiers operation - efficiency - Class A amplifier with load - Class B push-pull amplifier - Distortion in amplifiers - MOSFET power amplifier-Tuned Amplifiers-Single, Double Tuned and Stagger Tuned Amplifiers.

UNIT-III WAVE SHAPING AND MULTIVIBRATORS 9

RC & RL Integrator, Differentiator, Clippers, Clamper Design of Monostable, Bistable and Astablemultivibrators-Schmitt trigger-Monostable and Astable blocking oscillators using emitter based timing-UJT Saw tooth generator.

UNIT-IV 8085 MICROPROCESSOR 9

Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set-Addressing modes-Simple programs using arithmetic and logical operations.

UNIT-V I/O INTERFACING 9

Memory interfacing and I/O interfacing with 8085 – parallel communication interface –serial communication interface – timer-keyboard/display controller – interrupt controller –DMA controller (8237) – applications – stepper motor .

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Sedra / Smith, Micro Electronic Circuits Oxford University Press, 2004.
2. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007.
3. Ramesh S. Gaonkar ,"Microprocessor – Architecture, Programming andApplications with the

8085" Penram International Publisher , 5th Ed.,2006

REFERENCE(S)

1. Millman J. and Taub H., Pulse Digital and Switching Waveforms, TMH, 2000.
2. Schilling and Belove, Electronic Circuits, 3rd Edition, TMH, 2002.
3. Robert L. Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory, 9th Edition, Pearson Education / PHI, 2002.
4. David A. Bell, Solid State Pulse Circuits, Prentice Hall of India, 1992.
5. Millman and Halkias. C., Integrated Electronics, TMH, 1991.
6. A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 2007.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2								2		3	2	2
CO2	3	3	3	2	1	1						2		3	2	2
CO3	3	3	3	2	1	1						2		3	2	2
CO4	3	3	3	2	1							2		3		2
CO5	3	3	3	2	1	1						2		3		2
CO6	3	3	3	3	1	1						2		3		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC42	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites:	12EC31 - Electronic Circuits I					
Aim:	Enable the student to design the electronic circuits using linear integrated circuits and their applications in the processing of analog signals.					
Course Objectives:	To make the students to: • design linear and non linear applications of op –amps • design applications using analog multiplier and PLL • design ADC and DAC using op –amps • generate waveforms using op –amp circuits • analyze special function ICs					
Course Outcomes:	1.Demonstrate the manufacturing of IC's and fabrication of active and passive components. 2.Examine the operational amplifier stages and its ac, dc performance characteristics. 3.Elucidate and design the linear and non-linear applications of an Op amp and special application ICs. 4.Design and develop analog multipliers and PLL. 5.Classify and comprehend the working principle of data converters. 6.Illustrate the functions of application specific ICs such as Voltage regulators, PLL and their applications in communication.					

UNIT-I IC FABRICATION AND CIRCUIT CONFIGURATION FOR LINEAR ICs 9

Advantages of ICs over discrete components – Manufacturing process of monolithic Ics – Construction of monolithic bipolar transistor – Monolithic diodes – Integrated Resistors – Monolithic Capacitors – Inductors. Current mirror and current sources, General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT-II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass.

UNIT-III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell - Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT-IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type - Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT-V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, VideoAmplifier, Isolation Amplifier, Opto-couplers and fiber optic IC.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.

REFERENCE(S)

1. S.Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.
2. B.S.Sonde, System design using Integrated Circuits , New Age Pub, 2nd Edition, 2001
3. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
4. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall / PE, 4th Edi, 2001.
5. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, PHI, 1996.
6. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, PE, 2004.
7. K Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2					2			2		3		2
CO2	3	3	3	2	2							1	1	3	1	2
CO3	3	3	3	2	1	2			1			2	1	3	2	2
CO4	3	3	3	2	1				1			2	1	3	2	2
CO5	3	3	3	3	1							2	1	3	2	2
CO6	2	2	2	2	2	1			1			2	1	3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium)3:Substantial(High)

12EC43	ELECTROMAGNETIC FIELDS AND WAVEGUIDES		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites:	12F2Z3 - Engineering Physics-II					
Aim:	To Understand the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields so that an in depth understanding of antennas, an electronic device, Waveguides is possible.					
Course Objectives:	• To analyze fields potentials due to static changes. • To evaluate static magnetic fields. • To understand how materials affect electric and magnetic fields. • To understand the relation between the fields under time varying situations. • To understand principles of propagation of uniform plane waves.					
Course Outcomes:	1. Summarize the co-ordinate systems and apply conversion between them. 2. Analyze the fundamentals of Electrostatic and Electromagnetic including Divergence Theorem, Stokes theorem, Amperes Circuital law, Gauss Law and others. 3. Apply curl, divergence and gradient to the problems in Electrostatics and Electromagnetic. 4. Interpret the wave equations and waves in different media like free space, lossy and lossless dielectric. 5. Demonstrate the Maxwell's equations for static and time varying fields. 6. Estimate the propagation of waves in waveguides. 7. Analyze the TE and TM modes.					

UNIT-I STATIC ELECTRIC FIELDS 12

Introduction to Co-ordinate System: Rectangular – Cylindrical and Spherical Coordinate System **Coulomb's law and Electric Field Intensity:** The experimental Law of Coulomb, Electric field intensity, Field due to a continuous Volume Charge Distribution, Field of Line Charge, Field of a Sheet of Charge.

Electric Flux Density, Gauss's Law: Electric Flux Density, Gauss's Law, Application of Gauss's Law : Differential Volume Element, Some Symmetrical Charge distributions.

UNIT-II DIVERGENCE, ENERGY AND POTENTIAL 12

Divergence, Energy and Potential: Divergence, Maxwell's First Equation (Electrostatics), vector operator and Divergence Theorem, Energy expended in moving a point charge in an electric field, Line integral, Definition of Potential Difference and Potential, Potential field of a point charge, Potential field of a system of charges: conservative property, Potential Gradient, Energy Density in the Electrostatic Field ,Poisson's and Laplace's equation.Current , Conductors & Dielectrics: Current and Current Density, Continuity of Current, Properties of Conductors and Dielectrics, Method of Images, Boundary Conditions for conductors and perfect dielectric materials.

UNIT-III STEADY MAGNETIC FIELD 12

Curl – Stoke's Theorem - Biot-Savart Law – Magnetic Field intensity due to a finite and infinite wire carrying a current I – Ampere's circuital law and its proof. Magnetic flux density – The Lorentz force equation for a moving charge – Force on a differential current element – force between differential current elements – Torque on a loop carrying a current I – Magnetic moment – Magnetic Vector Potential- Nature of Magnetic Materials - Magnetic Boundary Conditions.

UNIT-IV MAXWELL'S EQUATION AND ELECTROMAGNETIC WAVES 12

Maxwell's equations in Point and Integral form for static and time varying fields - Wave Equations

-Wave Propagation in Lossy dielectrics, plane waves in Loseless Dielectrics, Plane waves in free space, plane waves in good conductors, skin effect, Power and the Poynting vector, Reflection of Plane Waves – normal and oblique incidence.

UNIT-V WAVEGUIDES 12

Guided Waves and Waveguides: Plane wave analysis of the Parallel-plate waveguide, Parallel-plate guide analysis using the wave equation, Rectangular Waveguides, Transverse Magnetic (TM) modes , Transverse Electric (TE) modes, wave propagation in the guides, Power transmission and attenuators.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. William H.Hayt,"Engineering Electrmagnetics", Tata McGraw-Hill,2011.
2. Mathew N.O.Sadiku, "Elements of Electromagnetics", Oxford Press Int. Edition, 2009.

REFERENCE(S)

1. S.Baskaran,"TransmissionLinesandWaveguides",Scitech Publications(India) PVT.LTD,Chennai,2011
2. David K.Cheng , "Field and Wave Electromagnetics"', Pearson Edition ,1999.
3. Umesh Shinha,"Electromagnetic Theory and its Applications",Satya Prakashan,1996.
4. Gangadhar.K.A,"Field Theory"Khanna Publishers, 2002.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(91-100), A(81-90), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3								1	3	1		
CO2	3	3	2	2	1							1	3	1	2	
CO3	3	3	3	3	2							1	2	1	2	
CO4	3	3	2	2	2							1	2	1	2	
CO5	3	3	3	2	2							1	3		2	
CO6	3	3	2	2	1							1	2		2	
CO7	3	3	3	2	2							1	2		2	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial

12EC44	SIGNALS AND SYSTEMS		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites:	12MA31 - Transforms and Partial Differential Equations					
Aim:	To study and analyze characteristics of continuous, discrete signals and systems.					
Course Objectives:	• To study the properties and representation of discrete and continuous signals. • To study the sampling process and analysis of discrete systems using z transforms. • To study the analysis and synthesis of discrete time systems.					
Course Outcomes:	1. Classify the signals and systems with their properties. 2. Apply Fourier transform and Laplace transform to CT and DT systems. 3. Apply Z transform to Characterize DT Linear time invariant systems. 4. Illustrate sampling and reconstruction of signals. 5. Apply Z transform to characterize Discrete time systems. 6. Design and develop the continuous and discrete state-variable models.					

UNIT-I INTRODUCTION OF SIGNALS AND SYSTEMS 12

Classifications of signals- Transformation of independent variable- Energy and Power signals- Periodic signals-Symmetric and Asymmetric signals- Exponential and Sinusoidal signals- Classifications of systems-Systems modeling-invertability-Some ideal signals-Properties of elementary signals- Linear convolution integral.

UNIT-II ANALYSIS OF LTI CONTINUOUS TIME SYSTEMS - (TIME DOMAIN AND FREQUENCY DOMAIN) 12

Response of causal LTI systems described by differential equations- Fourier Series and its properties- Fourier Transform- Properties of Fourier transform – Fourier transform pairs- Fourier transform of periodic signals – Laplace transform – One sided Unilateral Laplace transform-Properties of Laplace transform – Inverse Laplace transform – Two sided bilateral Laplace transform – Laplace transform of LTI differential equation – Laplace transform solution of LTI continuous time systems.

UNIT-III ANALYSIS OF LTI DISCRETE TIME SYSTEMS – (TIME DOMAIN AND FREQUENCY DOMAIN) 12

Properties of discrete time sequences – linear convolution- discrete time LTI systems described by difference equations – Fourier series of discrete time periodic signals – Z-transform analysis of discrete time systems – Z –transform – properties of Z- transform – inverse Z-transform .

UNIT-IV DFT- FFT AND SAMPLING 12

Discrete Fourier transform (DFT) – closed form discrete Fourier transform – properties of DFT – computation of DFT and Fast Fourier transform (FFT) – DFT errors and their minimization – FAST Fourier transform – Sampling : Representing a continuous – time-Signal by its Discrete Samples sampling – Discerte – time Processing of continuous time signals – Sampling Discrete time signals – Discerete time Decimation.

UNIT-V LTI- CONTINUOUS TIME AND DISCRETE TIME SYSTEMS 12

Frequency domain analysis of systems - Fourier analysis of sampled signals – Response of LTI discrete time systems using Z- transform – Steady state sinusoidal response of LTI – DT system – Delay operator and Z -block diagrams – Concept of state , state variables and state model – state variable model – transfer function of state variable model – diagonalization – solution of LTI state equations : Laplace transform method – state equations discrete time systems – discretisation of continuous time equations.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. John G.Proakis and Dimitris G.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, 4th edn., PHI, 2007.
2. S.Salaivahanan ,A.Vallavaraj, C.Gnanapriya ,Digital Signal Processing,2nd edition , TMH/McGraw Hill International 2010.

REFERENCE(S)

1. J Nagarth,S.N Sharan, Rakesh Rajan, Signals and Systems, McGRawHill second edition 2010.
2. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
3. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3			3	2						2	2		3	
CO2	3	3		3	3							2	2		3	2
CO3	3	3	3	3	3							2	2		3	2
CO4	3	3	2	3	2	2						2	3		3	2
CO5	3	3	3	3	3							2	2		3	2
CO6	3	3	3	2								2	2	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12GE31	ENVIRONMENTAL SCIENCE AND ENGINEERING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites:	12F2Z4 - Engineering Chemistry II					
Aim:	To create awareness about the importance of environment, the effect of technology on the environment and ecological balance.					
Course Objectives:	• To identify the precious resources in the environment. • To understand the role of a human being in maintaining a clean environment. • To realize the importance of government and non-government organization in environment managements. • To trace the flow of energy in a food chain. • To describe the problems caused by noise and light pollution. • To study the effects of acid rain, ozone depletion, and global warming on living and nonliving environments.					
Course Outcomes:	1. Verify the importance of environment and need for biodiversity. 2. Classify the roles of an individual in prevention of pollution. 3. Construct the roles of an individual in conservation of natural resources. 4. Evaluate the liability of non-governmental organization in environmental ethics. 5. Discuss the impact of social issues 6. Value the role of information technology in environment and human health.					

UNIT-I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition,scopeandimportanceofenvironment–needforpublicawareness-concept of an ecosystem–structure and function of an ecosystem– producers, consumers and decomposers – energy flow in the ecosystem–ecological succession–foodchains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a)forest ecosystem (b)grassland ecosystem (c)desert ecosystem (d)aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographically classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values– Biodiversity at global, national and local levels–India as a mega-diversity nation–hot-spots of biodiversity– threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India–conservation of biodiversity :In-situ and ex- situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems–pond, river, hill slopes, etc.

UNIT-II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a)Air pollution (b)Water pollution (c)Soil pollution (d)Marine pollution (e)Noise pollution (f)Thermal pollution (g)Nuclear hazards–soil waste management: causes, effects and control measures of municipal solid wastes–role of an individual in prevention of pollution – pollution case studies– disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site–Urban/Rural /Industrial /Agricultural.

UNIT-III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests 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, case studies–Food resources: World food problems, changes

caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies –Energy resources: Growing energy needs, renewable and non -renewable energy sources, use of alternate energy sources. Case studies– Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification–role of an individual in conservation of natural resources–Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets–river/forest/grassland/ hill /mountain.

UNIT-IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy– water conservation, rainwater harvesting, watershed management–resettlement and rehabilitation of people; its problems and concerns, case studies – role of non- governmental organization-environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.– wasteland reclamation–consumerism and waste products– environment protection act–Air (Prevention and Control of Pollution)act–Water (Prevention and control of Pollution) act–Wild life protection act– Forest conservation act–enforcement machinery involved in environmental legislation-central and state pollution control boards-Public awareness.

UNIT-V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations–population explosion–family welfare programme–environment and human health–human rights–value education – HIV/ AIDS– women and child welfare–role of information technology in environment and human health– Case studies.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).
2. P.Meenakshi, "Elements of Environmental science and Engineering", Prientice Hall of India, 2nd Edition.
3. Anubha Kaushik and C.P.Kaushik, 'Environmental Science and Engineering', 3rd Edition New age International Publishers, New Delhi 2008.

REFERENCE(S)

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
3. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
4. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
5. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assessment Tests (60%)	Assignment/Seminar (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2					2	3	1				2				
CO2	2					2	2	1	2		2	2				
CO3	2					3	2	1	2		2	3				
CO4	2					3	2	1	2	1	2	2				
CO5	1					3	2	1	2	1	2	2				
CO6	2					3	2	1	2	1		2	1			

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC45	ELECTRONIC CIRCUITS II & MICROPROCESSOR LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category :	Core					
Prerequisites/Co requisites (CR):	12EC36 - Electronic Circuits I Lab 12EC41 - Electronic Circuits II & Microprocessor (CR)					
Aim:	To make the students design and analyze feedback amplifiers, oscillators, tuned amplifiers, wave shaping circuits, multivibrators and program with microprocessor.					
Course Objectives:	To make the students to: • design amplifiers and tuned amplifiers • design oscillators and multivibrators • develop skills in programming and interfacing with microprocessor					
Course Outcomes :	1. Design series and shunt feedback amplifiers and various types of oscillators. 2. Analyze and design tuned amplifiers. 3. Design wave shaping circuits. 4. Make use of circuit simulation software (PSpice) to design electronic circuits. 5. Develop programming and debugging skills with 8085 microprocessor. 6. Interface the external devices with 8085 microprocessor.					

LIST OF EXPERIMENTS

DESIGN OF FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers:
2. RC Phase shift oscillator, Hartley Oscillator,
3. Colpitts Oscillator
4. Tuned Class C Amplifier
5. Integrators, Differentiators, Clippers and Clampers

SIMULATION USING PSPICE

1. Astable, Monostable and Bistable multivibrator - Transistor bias

MICROPROCESSOR LAB

1. Programming with 8085
2. Interfacing 8085 with 8255, 8279, 8251, & Stepper Motor

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2					3					3	1	2
CO2	3	3	3	2					3					3	2	3
CO3	3	3	3	2					3			1		3	1	2
CO4	3	3	3	2					3					3	1	2
CO5	3	3	3	2					3							2
CO6	3	3	3	2					3			1				2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC46	LINEAR IC LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category :	Core					
Prerequisites/Co requisites (CR):	12EC36 - Electronic Circuit I Lab 12EC37 - Digital Lab 12EC42 - Linear Integrated Circuits and Applications (CR)					
Aim:	To acquire skills in designing and testing integrated circuits.					
Course Objectives:	To enable the students to: • design oscillators and amplifiers using operational amplifiers • design filters using Op amp and perform experiment on frequency response • analyze the working of PLL and use PLL as frequency multiplier • design DC power supply using ICs • analyse the performance of oscillators and multivibrators using PSpice					
Course Outcomes :	1. Analyze the characteristics of inverting and non inverting amplifiers. 2. Design and construct various applications of Op-Amp. 3. Design and implement different types of oscillator circuits, waveforms generators using Op amps. 4. Build various circuits using Timer and PLL IC's. 5. Construct DC power supply using LM317 and LM723. 6. Design amplifiers, filters and waveform generation circuits using PSpice netlists.					

LIST OF EXPERIMENTS

1. Inverting, Non-inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier.
4. Active Lowpass, Highpass and Bandpass filters.
5. Astable and Monostable multivibrators and Schmitt trigger using Op-Amp.
6. Phase shift and Wien bridge oscillators using Op-Amp.
7. Astable and Monostable multivibrators using NE555 timer.
8. PLL characteristics and its use as frequency multiplier.
9. DC power supply using LM317 and LM723.
10. Study of SMPS.
11. Simulation of Experiments 3, 4,5,6,7 using PSpice netlists

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2					3					1	3	
CO2	3	3	3	2					3				2		2	1
CO3	3	3	3	2					3							3
CO4	3	3	3	2					3							
CO5	3	3	3	2	3				3				3	2	1	2
CO6	3	3	3	2	3				3				1	1		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC47	ELECTRICAL ENGINEERING LABORATORY		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites :	12EC35 - Electrical Engineering					
Aim:	To expose the students to the concepts of various types of electrical machines and transmission and distribution of electrical power.					
Course Objectives:	• To provide hands on experience with generators and motors. • To understand the working of DC/AC motors and generators. • To study the open and Short Circuit tests on single phase transformer. • To learn the testing of transformer. • To gain knowledge about starters for AC/ DC Motors.					
Course Outcomes:	1. Perform the test on DC machines and also control the speed of dc shunt motor. 2. Perform the open circuit test and the load test on a given DC generator and draw the characteristic curves. 3. Execute load test on Induction motor and transformer. 4. Predetermine the load test on a given single phase transformer and draw its performance curves. 5. Determine the regulation of alternator by EMF and MMF method. 6. Examine the importance of starters and select suitable starter for an electrical motor					

LIST OF EXPERIMENTS

1. Speed control of DC shunt motor.
2. Swinburne's Test.
3. Load Test on DC series motor.
4. Load and Magnetization characteristics of separately excited generator.
5. Load and Magnetization characteristics of self-excited generator.
6. Load test on DC compound generator.
7. Load test on DC Shunt Motor.
8. Load test on DC Compound Motor.
9. Open and Short Circuit tests on single phase transformer.
10. Regulation of Alternator by EMF and MMF method.
11. Equivalent circuit of three phases Induction motor.
12. Load test on three phase Induction motor.
13. Load test on single phase transformer.
14. Load test on single phase Induction motor.
15. Study of Starters: for AC motors and DC motors.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2					3					3		2
CO2	3	2	2	2					3					3		2
CO3	3	2	2	2	1				3					3		2
CO4	3	2	2	2	1				3					3		2
CO5	3	2	2	2	1				3					3	2	2
CO6	3	2	2	2	1				3					3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12HS41	PROFESSIONAL ENGLISH-II		L	T	P	C
			0	0	1	1
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites:	12HS31 - Professional English I					
Aim:	To Create an Environment to experiment Professional English communication module with Intermediate resources.					
Course Objectives:	• To be competent in Presentation skill. • To develop students' accuracy in Written Communication. • To improve learners ability to understand Technical Presentations and Conversations. • To give the exposure with Internal and External workplace Communication.					
Course Outcomes:	1. Develop grasping skill to interpret the text. 2. Create technical communication at work place. 3. Distinguish sounds of English to respond any queries. 4. Identify vocabulary for effective communication. 5. Improve communication skills for technical Presentations and Conversations. 6. Evaluate the topic and Present personal opinion using suitable verbal and non verbal cues.					

A. Reading **4**

1. Reading Technical Articles, Reports, Proposals for gathering information.
2. Reading Technical Journals, User manuals, annual reports for matching information

B. Writing **6**

1. Writing E-mail to inform/respond/Insist/Convince/comment
2. Writing Technical Report (Format, Types, Abstract)
3. Writing Project Introduction/Website/Product
4. Writing User Manuals/Guidelines
5. Writing Product Reviews
6. Writing Useful Expressions for Persuading, Summarizing, gathering information

C. Listening **2**

1. Listening to Telephonic conversation for filling the gaps
2. Listening to Group discussion to gather information
3. Listening to Interviews for writing short answers
4. Listening to Technical Presentation for evaluation

D. Speaking **6**

1. Mini-Presentation on Technical Themes:
   a) Cloud computing b) 4g c) Mission to Mars
   d) Water Resource e) Sixth Sense Technology
2. Group Discussion on Social and Technical issues

TOTAL: 18 PERIODS

TEXT BOOKS

1. Technical Communication: Principles and Practice, 2/e, MEENAKSHI RAMAN; SANGEETA SHARMA ISBN: 0198065299, 9780198065296
2. Business Benchmark Pre-Intermediate to Intermediate: Student's Book BEC Preliminary Edition, Norman Whitby, PB + 2 Audio CDs, ISBN: 9780521759397

Examination Guideline

Internal and External Examinations should be considered only from The BUSINESS ENGLISH oriented Articles/Extracts/Clips/Illustrations/Audio scripts.

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				1					2	2	1	3				
CO2								1	3	3	3	3				
CO3				1					3	3	2	3				
CO4				1					3	3	3	3				
CO5								1	3	3	3	3				
CO6				1				1	3	3	3	3				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC51	CONTROL SYSTEMS		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category:	Core					
Prerequisites:	12MA31 - Transforms and Partial Differential Equations					
Aim:	To familiarize the students with concepts related to the operation analysis and stabilization of control systems.					
Course Objectives:	The objective of the course is to make the students to: • understand the open loop and closed loop (feedback) systems • understand time domain and frequency domain analysis of control systems required for stability analysis • understand the compensation technique that can be used to stabilize control systems					
Course Outcomes:	1. Analyze and design the modelling of various physical systems. 2. Examine the time domain responses for first and second-order systems. 3. Investigate the transient and steady state performance of the systems. 4. Estimate the control system performance related to frequency-domain. 5. Investigate the stability of the control systems. 6. Design and develop the continuous and discrete state-variable models.					

UNIT-I CONTROL SYSTEM MODELING 12

Basic Elements of Control System – Open loop and closed loop systems – servo mechanism - Differential equation of physical system: Modeling of Electric systems, Translational and rotational mechanical systems – Transfer function: field control – Armature control, Block diagram Algebra - Block diagram reduction Techniques - Signal flow graph.

UNIT-II TIME RESPONSE ANALYSIS 12

Standard test signals - Time response analysis - First Order Systems, Second order systems - Steady state errors and error constants – Design specification of second order systems: P, PI, PD and PID Compensation, Design consideration Higher order systems.

UNIT-III FREQUENCY RESPONSE ANALYSIS 12

Frequency Response - Correlation between time and frequency response - Bode Plot, Polar Plot. Nyquist Stability Criterion - Closed frequency response: Constant M and N Circles - Nichol's Chart. Series - Parallel Compensators - Lead, Lag, and Lead Lag Compensators.

UNIT-IV STABILITY ANALYSIS 12

Concept of Stability, Routh Hurwitz Stability Criterion- Root Locus Technique: Construction of Root Locus, Dominant Poles, Application of Root Locus Diagram - Relative Stability, Sensitivity of the roots of character equation.

UNIT-V STATE VARIABLE ANALYSIS & DESIGN 12

Concept of state, State Variables and Model – State model for linear Continuous Time System – State Variable and Linear Discrete – Time Systems – Diagonalization - Solutions of the state equations - Concepts of Controllability and Observability.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.

REFERENCE(S)

1. Benjamin.C.Kuo, "Automatic Control Systems", Prentice Hall of India, 7th Edition, 1995.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum's Outline Series, "Feedback and Control Systems", Tata McGraw-Hill, 2007.
4. John J.D'azzo, Constantine H.Houpis, "Linear Control System analysis and Design", Tata McGraw-Hill, Inc., 1995.
5. Richard C. Dorf , Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1	3							3	2	1		2
CO2	3	3	3	3	3	2							2	1	2	2
CO3	3	3	3	3	2	2									2	2
CO4	3	3	3	3	3							2	2	1	2	3
CO5	3	3	2	3	3	2						3	2	1	2	3
CO6	2	3	3	3	3	2						3	2	1	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC52	COMPUTER ARCHITECTURE AND ORGANIZATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category:	Core					
Prerequisites:	12EC32 - Digital Logic Techniques And Circuits 12EC41 - Electronic Circuits II & Microprocessor					
Aim:	To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.					
Course Objectives:	• To demonstrate the basic structure and operation of a Digital computer. • To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division. • To discuss in detail the different types of control and the concept of pipelining. • To analyze the hierarchical memory system including cache memories and virtual memory. • To identify the different ways of communicating with I/O devices and standard I/O interfaces. • To identify the high performance architecture design.					
Course Outcomes:	1. Demonstrate the textual and numeric information can be represented in binary form and perform basic calculations within the binary system and demonstrate the history and development of modern computers. 2. Construct the basic internal design of computers and list the major components of a computer. 3. Summarize the various tradeoffs associated with Instruction Set Architectures (instruction formats, expanding op-codes, addressing modes). 4. Formulate and solve problems using various algorithms and measure the performance requirements of the systems. 5. Determine the operations of memory hierarchy and differentiate the merits and demerits of various memory structures. 6. Demonstrate the advanced architectural features such as pipelining, fast multiplication, superscalar operations, and parallel and RISC & CISC processors.					

UNIT-I INTRODUCTION 9

Computing and Computers, Evolution of Computers, VLSI Era, System Design- Register Level, Processor Level, CPU Organization, Data Representation, Instruction Formats, Instruction Types& Addressing modes.

UNIT-II DATA PATH DESIGN 9

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Floating Point Arithmetic, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Modified booth's Algorithm, Coprocessor.

UNIT-III CONTROL DESIGN 9

Hardwired Control, Micro programmed Control, Multiplier Control UNIT, CPU Control UNIT and Pipeline Processing: Design and Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, and Nano Programming.

UNIT-IV MEMORY ORGANIZATION 9

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT-V SYSTEM ORGANIZATION 9

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI

interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. John P.Hayes , 'Computer architecture and Organization', Tata McGraw-Hill, 3/e, 1998.

REFERENCE(S)

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
4. G.Kane & J.Heinrich, 'MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall, 1992.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(91-100), A(81-90), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2					1		2		2	2	3
CO2	3	2	2	2	2							2		2	2	3
CO3	2	2	2	2	1							2		2	2	3
CO4	3	2	3	2	2	2						2		2	2	3
CO5	3	2	2	2	2							2		2	2	3
CO6	2	2	2	2	1	2				1		2		2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC53	DIGITAL SIGNAL PROCESSING		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category:	Core					
Prerequisites:	12EC44 - Signals and Systems					
Aim:	To study the signal processing methods, processors and its applications.					
Course Objectives:	• To study DFT and its computation. • To study the design techniques for digital filters. • To study the finite word length effects in signal processing. • To study the non-parametric methods of power spectrum estimations. • To study the fundamentals of digital signal processors.					
Course Outcomes:	1. Evaluate the DFT and FFT of discrete time sequence. 2. Design digital IIR Butterworth and Chebyshev filters. 3. Design digital FIR filters using the windowing technique. 4. Investigate the finite precision effects such as input quantization, coefficient quantization multiplication round off and limit cycle oscillations. 5. Estimation of power spectrum parametric and non-parametric method. 6. Apply DSP in biomedical engineering and RADAR.					

UNIT-I DFT AND DESIGN OF INFINITE IMPULSE RESPONSE DIGITAL FILTERS 12

Review of DFT and FFT, Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Realization using direct, cascade and parallel forms**.**

UNIT-II DESIGN OF FINITE IMPULSE RESPONSE DIGITAL FILTERS 12

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Hamming, Hanning and Blackmann Windows – Frequency sampling method – Realization of FIR filters – Transversal, Linear phase and Polyphase structures.

UNIT-III EFFECTS OF FINITE WORD LENGTH IN DIGITAL FILTERS 12

Rounding and truncation errors-Quantization effects in A-D conversion of signals-output noise power from a digital system-coefficient quantization effects in direct form realization of FIR and IIR filters-limit cycle oscillations-scaling-quantisation errors in the computation of DFT.

UNIT-IV POWER SPECTRUM ESTIMATION 12

Estimation of spectra from Finite duration observation of signals, non- parametric methods for power spectrum estimation -Welch, Bartlett methods, parametric methods for power spectrum estimation -Yule-Walker method for the AR model parameters

UNIT-V APPLICATIONS 12

Applications of DSP in bio medical engineering-removal of artifacts-ECG applications-EEG applications-PCG applications-speech processing, Voice processing-speech signal-analysis of speech signals-short time spectrum analysis-speech analysis and synthesis system-compression and coding-channel vocoders-sub –band coding-voice privacy, Applications to RADAR-signal design.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. S.Salivahanan, Digital Signal Processing, 3rd Edition TMH/McGraw Hill International, 2010.

REFERENCE(S)

1. Moman .H. Hays, "Digital Signal Processing", Schaum's outlines, Tata McGraw-Hill Co Ltd.2004.
2. Ashok Amhardar, "Analog and Digital Signal Processing", 2 nd Edition Thomson 2002.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2							2	2		3	2
CO2	3	3	3	3	2	1						2	2		3	2
CO3	3	3	3	3	2	1						2	2		3	2
CO4	3	2	2	2	2							2	2		3	2
CO5	3	2	2	3	2							2	2		3	2
CO6	3	2	2	3	3	2						3	2		3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC54	ANTENNAS AND WAVE PROPAGATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category:	Core					
Prerequisites:	12EC43 - Electromagnetic fields and Waveguides					
Aim:	Enable the student to interpret the various types of antennas and wave propagation.					
Course Objectives:	Enable the students to: • explain the radiation from a current element • demonstrate antenna arrays, aperture antennas • classify &compare special antennas such as frequency independent and broadband antennas and to measure the characteristics • demonstrate the radio wave propagation					
Course Outcomes:	1. Identify properties of plane waves such as the relationship between E & H field, propagation constant and free space impedance. 2. Compute the Pointing vector and identify the power flow direction. 3. Evaluate the radiation field from an infinitesimal dipole and the characteristics of dipole antennas. 4. Evaluate and draw the antenna array factor for linear uniform array. 5. Demonstrate steer antenna beam in a linear uniform array. 6. Design, analysis and measurement of special antenna. 7. Identify the mechanism of the atmospheric effects on radio wave propagation.					

UNIT-I ANTENNA FUNDAMENTALS 9

Antenna parameters: Radiation pattern, , Beam solid angle, Directivity, Gain, Antenna Efficiency ,Input impedance, Polarization, Bandwidth ,Beam width, FBR, Reciprocity Theorem proof and its applications: Equivalence of Radiation patterns & Impedances, Effective aperture, Vector effective length, Antenna temperature.

UNIT-II WIRE ANTENNAS AND ANTENNA ARRAYS 9

Wire antennas: Short dipole, Radiation resistance and Directivity, Half wave Dipole, Monopole, Antenna Arrays: Various forms of antenna array, Array of Point sources, Linear array with n isotropic point sources of equal amplitude and spacing: Broadside and end fire array, Pattern Multiplication, Binomial Array, Small loop antennas.

UNIT-III APERTURE ANTENNAS 9

Aperture Antennas: Magnetic Current and its fields, Uniqueness theorem, Field equivalence principle, Duality principle, Method of Images, Slot antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat reflector, Corner Reflector, Common curved reflector shapes, Lens Antenna.

UNIT-IV TRAVELLINGWAVE ANTENNAS AND ANTENNA MEASUREMENT 9

Travelling wave antennas: Long wire, V and Rhombic Antenna, Yagi-Uda Antenna, Turnstile Antenna, Helical Antenna- Axial mode helix, Normal mode helix, Biconical Antenna, Log periodic Dipole Array, Spiral Antenna, Microstrip Patch Antennas.Antenna Measurements: Radiation Pattern measurement, Gain and Directivity Measurements, Anechoic Chamber measurement.

UNIT-V RADIO WAVE PROPAGATION 9

Modes of Propagation: Ground wave, space wave and sky wave propagation. Structure of atmosphere, Ground Wave Propagation: Ground Wave attenuation Factor Sky wave propagation: Propagation of radio wave and mechanism of radio wave bending through the ionosphere, skip distance, Virtual height, Critical frequency, MUF, Space wave propagation:

Range of space wave propagation, Effect of earth curvature on trophospheric propagation, Duct propagation.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. John D.Kraus "Antennas", Tata Mc Graw Hill, 2002.
2. K.D.Prasad "Antenna and Wave Propagation", Satya prakashan, 1996.

REFERENCE(S)

1. Constantine A,Balanis "Antenna Theory: Analysis and Design", John Wiley Publishers,2003
2. H.Griffiths, J.Encianas, A.Papiernik & Serge Drabowitch "Modern Antennas", Chapman & Hall, 2005.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2								2	3	2	2	3
CO2	3	3	2	2	1							2	3	2	2	3
CO3	3	3	2	2	1	1	1					2	3	1	2	3
CO4	3	3	2	2	1	1	1					2	3	1	2	2
CO5	2	2	3	3	1	1						2	3	2	2	3
CO6	3	3	2	2	2	1						2	3	1	2	2
CO7	3	2	2	2	2	2	1					1	3	1	2	2

1Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC55	ANALOG COMMUNICATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category:	Core					
Prerequisites:	12MA43 - Probability and Random Processes					
Aim:	To make the students for the foundation of analog communication to develop an appreciation used in telecommunications.					
Course Objectives:	To make the students to: • analyze the (amplitude& angle) modulation and demodulation systems • discuss continuous modulation systems • classify noise & its performance analysis.& compare pulse modulation techniques					
Course Outcomes:	1. Apply the basic knowledge of signals and systems and understand the basics of communication system and analog modulation techniques. 2. Compare different amplitude modulation schemes 3. Design the angle modulation circuits in communication systems 4. Show the noise performance in AM & FM receivers. 5. Summarize the theory of probability and the characteristics of various noises in communication. 6. Design analog pulse modulation circuits					

UNIT-I AMPLITUDE MODULATION 9

Need for modulation, Amplitude modulation, Virtues and limitations of Amplitude modulation, Linear modulation schemes, DSB-SC Modulation, Coherent detection, Costas receiver, Quadrature carrier multiplexing, SSB Modulation, vestigial side band modulation, Television signals, Frequency translation, Comparison of amplitude modulation systems.

UNIT-II ANGLE MODULATION 9

Frequency and phase modulation. spectrum of FM Wave, modulation index and Bandwidth of FM Signal, NBFM and WBFM, Comparison between FM and PM Signals, FM and AM signals, AM and NBFM Signals, Generation of FM signals, Demodulation of FM signals, slope detector, ratio detector, Foster Seeley discriminator, Pre-emphasis & De-emphasis, nonlinear effects in FM signals.

UNIT-III PERFORMANCE OF CW MODULATION SYSTEMS 9

Super heterodyne radio receiver and its characteristics, SNR;Noise in DSB-SC systems using coherent detection; Noise in AM system using envelope detection and its FM system, FM threshold effect, Comparison of performances.

UNIT-IV NOISE 9

Review of probability, random variable, random process, Gaussian process, Shot noise, thermal noise, white noise, narrowband noise, noise temperature, noise figure.

UNIT-V ANALOG PULSE MODULATION 9

Types of Pulse modulation, PAM, PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Frequency Division Multiplexing, Time Division Multiplexing.

TOTAL: 45PERIODS

TEXT BOOK(S)

1. Simon Haykin, "Communication Systems", John Wiley & sons, NY, 4th Edition, 2001.
2. H Taub & D. Schilling, Gautam Sahe. "Principles of Communication Systems", TMH, 2007 3rd Edition

REFERENCE(S)

1. Wayne Tomasi, "Electronic Communications Systems: Fundamentals Through Advanced Telecommunications Series", Edition5, Pearson/Prentice Hall, 2004

2. Dennis Roddy & John Coolen , " Electronic Communication", 4th Edition, Prentice Hall of India, 2008.
3. Herbert Taub & Donald L Schilling – "Principles of Communication Systems" 3rd Edition – Tata McGraw Hill, 2008.
4. B.P.Lathi, " Modern Digital and Analog Communication Systems", 3rd Edition, Oxford Press,2007.
5. John G. Proakis, Masoud Salehi, "Fundamentals of Communication Systems", Pearson Education, 2006.
6. George Kennedy, "Electronic Communication Systems", Tata McGraw Hill, 4th Edition,1999

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2								2	3		3	
CO2	2	3	2	2		1						2	3	2	2	2
CO3	3	2	2	2	2	2						2	3	3	2	2
CO4	3	2	2	2		2						2	3	2	2	2
CO5	3	3	2	2		2	2					2	3		2	
CO6	2	2	2	2	2	2						3	3	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC56	MICROCONTROLLERS ARCHITECTURE AND PROGRAMMING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category:	Core					
Prerequisites:	12EC41 - Electronic Circuits II & Microprocessor					
Aim:	To Study the architecture, programming, design & interfacing of microcontrollers.					
Course Objectives:	• To study the architecture, design and application of 8051 controller. • To study the architecture & interfacing of ARM & PIC controller. • To study the usage of open source controllers such as ardunio.					
Course Outcomes:	1. Enlighten the architecture of 8051 microcontroller and its addressing modes and instruction set. 2. Develop programming skills with the 8051 Microcontroller and design interface with LCD, Keyboard, ADC and others. 3. Illustrate the architecture of PIC Microcontroller and interfacing techniques with serial communication modules, Timers and others. 4. Analyze the architecture and instruction set of ARM Microcontroller. 5. Differentiate CISC and RISC, Van Neumann and Harvard architecture and compare ARM cores. 6. Analyze the architecture & Interface techniques of Arduino open source hardware and programming techniques.					

UNIT-I 8051 ARCHITECTURE 9

8051 Microcontroller hardware – input/output pins, ports, Circuits – Counters and Timers – Serial data input/output – Interrupts – Addressing modes – Instruction set.

UNIT-II 8051 MICROCONTROLLER DESIGN AND APPLICATION 9

Microcontroller Specification – Microcontroller Design – Testing and Design – Timing subroutines- Serial Data Transmission – 8051 Data Communication modes. Applications: Keyboards – Displays – Pulse Measurement – D/A and A/D Conversions – Multiple interrupts.

UNIT-III PIC MICRO CONTROLLER 9

Basis features, 16CFxx family PIC Microcontrollers, Architecture, Instruction set, I/O Ports, Timers, Serial communication modules,I^2C, UART

UNIT-IV ARM 9

RISC Architecture, ARM Architecture, ARM instruction set – multiplying instructions, conditional execution, data processing instructions, branch & branch with line instructions, ARM processor cores, interrupts, Memory size & speed, onchip memory, caches, cache design – memory management, ARM cores – ARM 7,8,9,10, RTOS

UNIT-V OPEN SOURCE CONTROLLERS 9

Arduino : Introduction- Programming – Serial Communication –A/D Conversion – Interrupt and Timing sub system – AVR Operating parameter and Interfacing, Applications

TOTAL: 45 PERIODS

TEXT BOOK(S)

7. Kenneth Ayala, The 8051 Microcontroller Architecture, Programming & Applications, 2nd ed., Penram International , 3rd Edition.
8. M.A.Mazidi & J.C.Mazidi, Miccontrollers & Embedded systems using Assembly & C, 2nd Edition, Pearson Education, 2007
9. Milan verle, PIC Microcontroller programming in C.
10. Steve Furber, ARM system on chip architecture 2nd edition 2000, Addision Wesley publishers.
11. Steven F.Barrett "Arduino Microcontroller Processing For Every One" Mitchell Thorton, Series Editor.

REFERENCE(S)

1. *John B Peatmen "Design With PIC Microcontrollers"*, Prentice Hall
2. ARM System Developer's Guide, 1st Edition Designing And Optimizing System Software
3. Steve Furber ARM System ON Chi Architecture Addison Wesley 2000
4. Steven F.Barrett "Arduino Microcontroller Processing For Every One" Mitchell Thorton, Series Editor.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2							2	1	2		3
CO2	3	3	3	2	2	2					2	2	2	2		3
CO3	3	3	3	2	3	1			2			2	2	2		3
CO4	3	2	2	2	2	1			2			2	1	2		3
CO5	3	2	2	2	3	1			2			2	1	2		3
CO6	3	2	2	2	3	2			2		2	2	1	2		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC57	DIGITAL SIGNAL PROCESSING LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category :	Core					
Prerequisites/Co requisites (CR):	12EC44 - Signals and Systems 12EC53 - Digital Signal Processing (CR)					
Aim:	To provide practical experience with the simulation and development of basic signal processing algorithms, using standardized environments such as MATLAB.					
Course Outcomes :	1. Design and implement digital signal processing algorithms using MATLAB. 2. Experiment with the algorithm for convolution of two signals. 3. Apply the fast Fourier transform for real time applications. 4. Design and implement IIR and FIR filters. 5. Demonstrate generation of sinusoidal and DTMF signals. 6. Analyze ECG and EEG signals.					

LIST OF EXPERIMENTS

1. Generation of basic continuous and discrete time signals
2. Find the DFT / IDFT for the given sequence
3. Compute linear and circular convolution of two sequences.
4. Find the impulse response of first order and second order systems
5. Design of digital IIR Butterworth filter-LPF & HPF
6. Design of digital IIR chebychev filter-LPF & HPF
7. Design of FIR filter using windowing technique
8. Generation of Sinusoidal signal through filtering
9. Generation of DTMF signals
10. Upsampling and downsampling
11. Analysis of ECG
12. Analysis of EEG
13. Determination of Power Spectrum of a given signal

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2				3	1	2	2	2		3	2
CO2	3	3	3	2	1				3	1	2	2	2		3	2
CO3	3	3	2	3	1				3	1		2	2		2	2
CO4	3	3	3	3	1	1			3	1	2	2	2		3	2
CO5	3	3	3	2	2	1			3	1		2	2		3	2
CO6	2	3	3	3	2	2			3	1	2	2	2		3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC58	ANALOG COMMUNICATION LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category :	Core					
Prerequisites/Co requisites (CR):	12EC36 - Electronic Circuits I Lab 12EC55 - Analaog Communication (CR)					
Aim:	To develope the students' skills classify modulation techniques, transmitters and receiver used in communication systems.					
Course Objectives:	To make the students to: • apply the concept of the modulation; demodulation techniques used in communication system used in both time and frequency domains • develope a pre-emphasis & de-emphasis circuits in analog communication • describe the operation of multiplexing techniques					
Course Outcomes :	1. Design different Modulation and demodulation circuits in analog communication. 2. Design Pre-emphasis & De-emphasis circuits. 3. Select the Multiplexing circuit in time and frequency domain. 4. Analyze and design of Mixer and cross over network. 5. Demonstrate sampling theorem. 6. Identify noise spectrum using Spectrum Analyzer.					

LIST OF EXPERIMENTS

1. Generate Amplitude modulated and demodulated signals
2. Generate AM- DSBSC.
3. Characteristics of AM receiver
4. Generate Frequency modulated and demodulated signals
5. Effects of Pre emphasis and de emphasis in a given signal
6. Generate pulse amplitude modulated and demodulated signals
7. Generate pulse width modulated and demodulated signals.
8. Generate pulse position modulated and demodulated signals
9. Design of Mixer
10. Design of Time division multiplexing
11. Design of Frequency division multiplexing
12. Verification of sampling theorem
13. Noise spectrum measurements using spectrum analyzer
14. Design of cross over network

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	1				3	1	2	2	3	1	1	
CO2	3	2	2	2	1				3	1	2	2	2	1	1	
CO3	2	2	3	2	1				3	1	1	2	2	1	1	
CO4	3	3	2	2	2				3	1	1	2	2	1	1	
CO5	2	2	2	2	1				3	2	1	2	2	1	2	
CO6	2	2	2	2	2	2			3	1	1	2	2		2	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC59	MICROCONTROLLERS LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	V			
Category:	Core					
Prerequisites/ Corequisites (CR):	12EC45 - Electronic Circuits II & Microprocessor Lab 12EC56 - Microcontrollers Architecture and Programming (CR)					
Aim:	To program and analyze the different applications using 8051 microcontroller, PIC, ARM and Arduino.					
Course Objectives:	• To program and experiment the small application using 8051 microcontroller. • To program and analyze the interfafcing technique using PIC. • To program and evalute the different applications using ARM. • To program and analyze the interfafcing technique using Arduino.					
Course Outcomes:	1. Develop programs for arithmetic and logical operations and small applications in 8051 microcontroller. 2. Design Interfacing of 8051 Microcontroller with LCD, Keyboard, ADC and others. 3. Analyze and design the traffic light controller using 8051. 4. Develop programs using PIC microcontroller for interfacing with serial communication modules. 5. Develop applications like stepper motor control using ARM processor. 6. Design sensor based application circuits using Arduino.					

LIST OF EXPERIMENTS

1. Arithmetic Operation on 8051 Microcontroller
2. Stepper motor Interfacing With 8051 Controller
3. Implementation of Traffic light using 8051 Controller
4. Do the Following Experiment using PIC controller
   1)To enable single bit 2).To enable all Bits 3).To blink a single Bit 4).Toggle all l
   5).Binary counting 6).Led shift bitwise 7).Led shift by shift operator
5. System design using PIC Microcontroller - UART
6. ARM Processor Programming – Interrupt Buzzer, Stepper motor Controller
7. RTOS experiments using ARM
8. Basic experiments using Arduino board - Blinking LED
9. Implementation of adder circuit with Arduino.
10. Implementation of ADC using Arduino.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	2			3	1	2	2	2	2		3
CO2	3	2	3	3	1	2			3	1	2	2		2		3
CO3	3	3	3	3	2	2			3	1	1	2		2		2
CO4	3	2	3	3	2	2			3	1	2	2	2	2		2
CO5	3	2	3	2	2	2			3	1	2	2	2	2		2
CO6	3	3	3	2	2	2			3	1	2	2	2	2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12HS51	ENGLISH FOR EMPLOYMENT-I		L	T	P	C
			0	0	2	1
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	IV			
Category:	Core					
Prerequisites:	12HS41 - Professional English II					
Aim:	To practice English for Enhancing Employability skills					
Course Objectives:	• To get proficiency in business communication at work place. • To develop students accuracy in communication. • To improve learners ability to understand any kind of text.					
Course Outcomes:	1. Develop analytical skill and vocabulary. 2. Improve job prospects. 3. Predict the main idea of the topic and use verbal cues. 4. Develop negotiation skill. 5. Develop student's job prospects through oral communication. 6. Utilize documentation methodology.					
Task: 1	Verbal Reasoning		2			
Task: 2	Resume and Covering Letter		2			
Task: 3	Channel Conversations		4			
Task: 4	Debate		4			
Task: 5	Mock Interview		4			
Task: 6	Documentation methodology for Projects/ Products/ Softwares		2			
		TOTAL: 18 PERIODS				

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		3		3		1			3	3	1	3				
CO2					1	1			3	3	1	3				
CO3						1			3	3	1	3				
CO4				2		1			2	2	2	2				
CO5				2		1		2	2	2	2	2				
CO6					2	1		2	2	3	3	3				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12GE32	PROFESSIONAL ETHICS IN ENGINEERING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites:	---					
Aim:	To discuss the essential elements of the ethical and professional practice of psychology.					
Course Objectives:	• To develop professional skills such as report writing, record keeping and analyzing ethical dilemmas in psychological practice. • To summarize the role play experience in court procedures. • To make the students to be ethically aware in their professional practice. • To explain the Code of Ethics.					
Course Outcomes:	1. Summarize the codes of general ethics and Engineering Ethics. 2. Analyze the moral complexities in all the engineering activities and decision-making processes. 3. Make use of engineering ethics to justify a solution to an engineering problem based on professional and ethical standards. 4. Design a system, component, process or products, almost satisfying all the aspects of safety, to meet the desired needs. 5. Differentiate the personal, professional and ethical responsibilities and rights to engage in life-long learning. 6. Build a multi-disciplinary team and direct the efforts of a team in ethical manner.					

UNIT-I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT-II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics – Codes of Ethics – Industrial Standards – A Balanced Outlook on Law – The Challenger Case Study.

UNIT-III SAFETY AND RISK 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal.

UNIT-IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR).

UNIT-V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.

REFERENCE(S)

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003
3. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.

4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3							3	3	2	2	3				
CO2	3			3		2		3	3	2	2	2				
CO3	3	2		2		3		3	3	2	2	2	1			
CO4	3	2		2	2	3	2	2	2	2	2	3	1	1	1	1
CO5	3							2	3	2	2	3				
CO6	3							2	3	2	3	2				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC61	VLSI DESIGN		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites:	12F2X5 – Electric Circuits and Electron Devices 12EC32 – Digital Logic Techniques and Circuits					
Aim:	To study and analyze the basic concepts of digital VLSI chip design using the simpler VLSI technology.					
Course Objectives:	• To analyze the basic CMOS circuits. • To construct the CMOS process technology. • To examine the techniques of chip design using programmable devices. • To compare the concepts of designing VLSI subsystems. • To build the concepts of modeling a digital system using Hardware Description Language.					
Course Outcomes:	1. Construct the logic circuit layouts for both static CMOS and dynamic CMOS circuits. 2. Apply CMOS technology for specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects. 3. Design combinational and sequential logic circuits using static CMOS at the transistor level, including mask layout. 4. Compare the tradeoffs of sequencing elements including flip-flops, transparent latches, and pulsed latches. 5. Infer the silicon debug principles and manufacturing test. 6. Design and construct different types of modeling for a digital system using Hardware Description Language.					

UNIT-I MOS TRANSISTOR THEORY AND CMOS PROCESSING TECHNOLOGY 9

A brief History –MOS transistors, Long channel I-V characteristics, C-V characteristics, Non ideal IV effects, DC transfer characteristics, CMOS fabrication technologies, Layout design rules, CMOS Process Enhancements.

UNIT-II DEVICE CHARACTERIZATION 9

Delay estimation- Logical effort and Transistor sizing, Power dissipation- static and dynamic power dissipation and Reduction , Interconnect, Design margin, Reliability, Scaling.

UNIT-III COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN 9

Combinational circuit families – circuit pitfalls, Sequencing static circuit – circuit design of latches and flip flops.

UNIT-IV CIRCUIT SIMULATION AND CMOS TESTING 9

SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation, Need for testing- Testers, Text fixtures and test programs- Logic verification- Silicon debug principles - Manufacturing test – Design for testability – Boundary scan

UNIT-V SPECIFICATION USING VERILOG HDL 9

Basic concepts – identifiers – gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL modeling, structural gate level & switch level modeling , Behavioral and RTL modeling , Test benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005
2. Samura Palnitkar –verilog HDL –Guide to digital design and synthesis , 3rd edition , Pearson Education 2003

REFERENCE(S)

1. D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003
2. J.Bhasker: Verilog HDL primer, BS publication,2001

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	3		1					3		3		2
CO2	3	3	3	3	3	2						2		3		2
CO3	3	2	3	3	2	2	1					2		3		2
CO4	2	2	2	2	1	1						2		3		2
CO5	2	3	3	2	2	2	1					1		3		2
CO6	3	3	3	3	3	2	1					3		2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC62	DIGITAL COMMUNICATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites:	12EC55 - Analog Communication					
Aim:	Explain the basic concepts of Digital Communication in baseband and pass band domains and to give an exposure to error control coding techniques.					
Course Objectives:	To enable the students to: • analyze PCM systems • design error control coding schemes • design and implement base band transmission schemes • analyze the digital modulation and spread spectrum techniques					
Course Outcomes:	1. Demonstrate the source coding techniques, information theory and analog to digital conversion. 2. Analyze the error control codes like block code, cyclic code and convolutional codes. 3. Examine the baseband pulse shaping and estimate Power Spectra. 4. Classify the practical limitations in Communication Techniques such as aliasing and inter symbol interference (ISI). 5. Analyze and compare the performance of different digital modulation techniques. 6. Illustrate the spread spectrum communication system.					

UNIT-I INTRODUCTION AND WAVEFORM CODING TECHNIQUES 9

Uncertainity, Information and Entropy, Source coding theorem, Huffman coding, Discrete memoryless channels, Mutual information, channel capacity, Sampling process -PAM- Pulse code modulation, channel noise and error probability, quantization noise and signal to noise ratio, Differential Pulse code modulation, Delta modulation

UNIT-II ERROR CONTROL CODING 9

Discrete memoryless channels - Linear block codes - Cyclic codes - Convolutional codes - Maximum likelihood decoding of convolutional codes-Viterbi Algorithm-Trellis coded Modulation-Turbo codes –Applications

UNIT-III BASEBAND SHAPING FOR DATA TRANSMISSION 9

Discrete PAM signals, Power spectra of discrete PAM signals, Intersymbol interference, Nyquist criterion for distortion less baseband binary transmission, correlative coding, Eye pattern

UNIT-IV DIGITAL MODULATION TECHNIQUES 9

Generation of ASK,PSK,FSK - Signal space diagram - matched filter-detection - bit error probability and Power spectra of BPSK, QPSK, FSK -Differential phase shift keying - Comparison of Digital modulation systems - Carrier and symbol synchronization.

UNIT-V SPREAD SPECTRUM MODULATION 9

Pseudo- noise sequences-A notion of spread spectrum -Direct sequence spread spectrum with coherent binary phase shift keying - Signal space dimensionality and processing gain - Probability of error - Frequency Hop spread spectrum -Code Division Multiplexing.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Simon Haykins, "Digital Communication" John Wiley, 2009.
2. Amitabha Battacharya, "Digital Communications", Tata McGraw Hill, 2006.

REFERENCE(S)

1. Sam K.Shanmugam, "Digital & Analog Communication Systems", John Wiley, 2008.
2. John G.Proakis, Masoud Salehi, "Digital Communications", McGraw Hill, 4th Edition, 2008.
3. Taub & Schilling , "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition,2008.
4. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford Press,2007

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2							2	3	2	3	2
CO2	3	3	2	3	2							3	3	2	3	3
CO3	3	3	3	2	2							2	3	2	3	2
CO4	3	3	3	2	2	2						2	3	2	3	2
CO5	3	3	3	3	2	1						2	3	2	3	2
CO6	3	3	3	2	3	1						2	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC63	EMBEDDED SYSTEMS		L	T	P	C
			3	1	0	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites:	12EC56 - Microcontrollers Architecture and Programming					
Aim:	To give sufficient background for undertaking embedded and real time systems design					
Course Objectives:	• To introduce students to the embedded systems, its hardware and software. • To introduce devices and buses used for embedded networking. • To explain programming concepts and embedded programming in C and C++. • To explain real time operating systems and inter-task communication and an exemplary case of MUCOS–II RTOS.					
Course Outcomes:	1. Illustrate the differences between the general computing system and the embedded system, also recognize the classification of embedded systems. 2. Interface various devices and buses to the embedded hardware. 3. Develop the Embedded programming in C & C++. 4. Design real time embedded systems using the concepts of RTOS. 5. Apply various real-time task scheduling algorithm to embedded system. 6. Develop some real time applications through MUCOS-II RTOS.					

UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS 12

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits

UNIT-II DEVICES AND BUSES FOR DEVICES NETWORK 12

I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.

UNIT-III PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++ 12

Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of embedded programming in C++ - Objected Oriented Programming – Embedded Programming in C++, 'C' Program compilers – Cross compiler – Optimization of memory codes.

UNIT-IV REAL TIME OPERATING SYSTEMS – PART I 12

Definitions of process, tasks and threads – Clear cut distinction between functions – ISRs and tasks by their characteristics – Operating System Services- Goals – Structures- Kernel - Process Management – Memory Management – Device Management – File System Organisation and Implementation – I/O Subsystems – Interrupt Routines Handling in RTOS, REAL TIME OPERATING SYSTEMS : RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics – Co-operative Round Robin Scheduling – Cyclic Scheduling with Time Slicing (Rate Monotonics Co-operative Scheduling) – Preemptive Scheduling Model strategy by a Scheduler – Critical Section Service by a Preemptive Scheduler – Fixed (Static) Real time scheduling of tasks - INTER PROCESS COMMUNICATION AND SYNCHRONISATION – Shared data problem – Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message

Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – Remote Procedure Calls (RPCs).

UNIT-V REAL TIME OPERATING SYSTEMS – PART II 12

Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS – Understanding Case Definition – Multiple Tasks and their functions – Creating a list of tasks – Functions and IPCs –Exemplary CodingSteps.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOK(S)

1. Rajkamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill, First Reprint, 2003.
2. Wayne Wolf, "Computers as Components - Principles of Embedded Computer System Design", 3rd Edition Morgan Kaufmann Publisher, 2006.

REFERENCE(S)

1. Steve Heath, "Embedded Systems Design", 2nd Edition, Elsevier Publications, 2006.
2. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
3. Frank Vahid and Tony Gwasrgie, "Embedded system Design", John Wiley and Sons, 2002.
4. Richard H. Barnett, Larry D. O'Cull and Sarah Cox, "Embedded C Programming the Microchip PIC",Thomson delmar learning publications, 2004.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	1	1	1						2	1	2		3
CO2	3	2	3	2	2	1			2		1	1	2	2		3
CO3	2	3	3	3	3				2		1	2		2		3
CO4	3	3	3	2	3	3			2		1	2	2	2		3
CO5	2	3	2	2	1	1			2		1	1	2	2		3
CO6	2	2	2	2	2	1			2		1	1	1	2		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC64	COMPUTER COMMUNICATION AND NETWORKS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites:	12EC55 - Analog Communication					
Aim:	To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.					
Course Objectives:	• To introduce the students the functions of different layers. • To introduce IEEE standard employed in computer networking. • To make students to get familiarized with different protocols and network components.					
Course Outcomes:	1. Identify the different types of network topologies and protocols. 2. Enumerate the layers of the OSI model and TCP/IP and explain the functions of each layer. 3. Classify the Flow and Error control mechanism and wired LANs and wireless LANs. 4. Analyze and configure switching configurations including LANs and VLANs. 5. Compare and configure various internal routing protocols. 6. Clarify the sub netting, routing mechanisms and connection-oriented and connectionless protocol at the transport layer. 7. Illustrate the client/server programs and principles of cryptography and network security.					

UNIT-I PHYSICAL LAYER 9

Data Communications – Networks - Networks models – OSI model – Layers in OSI model – TCP / IP protocol suite – Addressing – Guided and Unguided Transmission media,Switching: Circuit switched networks – Data gram Networks – Virtual circuit networks.

UNIT-II DATA LINK LAYER 9

Data link control: Framing – Flow and error control –Protocols for Noiseless and Noisy Channels – HDLC Multiple access: Random access – Controlled access Wired LANS : Ethernet – IEEE standards – standard Ethernet – changes in the standard – Fast Ethernet – Gigabit Ethernet.Wireless LANS : IEEE 802.11–Bluetooth.

UNIT-III NETWORK LAYER 9

Logical addressing: IPv4, IPv6 addresses Internet Protocol: Internetworking – IPv4, IPv6 – Address mapping – ARP, RARP,BOOTP, DHCP, ICMP, IGMP, Delivery - Forwarding – Routing – Unicast, Multicast routing protocols.

UNIT-IV TRANSPORT LAYER 9

Process-to-Process delivery - User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QoS) – Techniques to improve QoS.

UNIT-V APPLICATION LAYER 9

Domain Name System (DNS) – E-mail – FTP – WWW – HTTP –Cryptography – Symmetric key and Public Key algorithms - Digital signature –Management of Public key

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill,2006:
2. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition,2003:

REFERENCE(S)

1. Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education.
2. James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown Approach Featuring",3/e, Pearson Education.
3. C.Sivaram Murthy, B.S.Manoj, "Ad hoc Wireless Networks – Architecture and Protocols", Second Edition, Pearson Education.
4. Greg Tomshon, Ed Tittel, David Johnson. "Guide to Networking Essentials", fifth edition, Thomson India Learning, 2007.
5. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2							2	3		2	3
CO2	3	3	2	2	2							2	2		2	2
CO3	3	3	2	2	2							2	3		2	2
CO4	3	2	2	2	2							2	3		2	2
CO5	3	2	2	3	2							2	2		2	2
CO6	3	2	2	3	2	2						2	3		2	2
CO7	3	3	2	2	2	2		2				2	3		2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC65	VLSI LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites/Co requisites (CR):	12EC37 - Digital Lab 12EC61 - VLSI Design (CR)					
Aim:	To design and experiment the digital circuits design using verilog HDL.					
Course Objectives:	• To construct the digital circuits using verilog HDL. • To synthesize the design at Register transfer level. • To construct the place, root and floor planning for the digital design. • To evaluate the design using test bench and simulator. • To build the digital design in FPGA board.					
Course Outcomes:	1. Construct and implement any Combinational and Sequential circuits design using different modeling in verilog HDL. 2. Construct and Synthesis the design in RTL and test the design using test bench. 3. Build the place, route and floor planning for the design and test in FPGA. 4. Build the layout level design for digital circuits using microwind tool. 5. Elaborate about FPGA board and testing on board LEDs and switches using verilog code. 6. Design real time clock and traffic light controller.					

LIST OF EXPERIMENTS

1. **Study of Synthesis tools**
   Half and full adder.
   a. Decoder – 2 x 4
   b. Priority encoder.
   c. Ripple adder.
   d. 4 – Bit ripple counter.
   e. Code conversion.
2. **Study of Simulation using tools**
   a. Half adder.
   b. Multiplexer – 2 x 1, 4 x 1
   c. Demultiplexer – 1 x 2, 1 x 4
3. **Study of Simulation using tools**
   a. Flipflop – D, T
   b. Priority encoder.
   c. Ripple adder.
   d. 4 – Bit ripple counter.
4. **Study of development tool for FPGAs for schematic entry and verilog**
   a. Full adder, half adder.
   b. Demultiplexer – 1 x 2, 1 x 4.
5. **Design and simulation of pipelined serial and parallel adders.**
6. **Study of Placing, Rooting and Back annotation for FPGAs**
7. **Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement.**
8. **Study of FPGA board and testing on board LEDs and switches using verilog code.**
9. **Design a Realtime Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.)**
   a. Demonstrate its working on the FPGA board.

b. To display binary number on the FPGA.

10. Design of traffic light controller using verilog tools.

a. Movement of vehicles in any direction or pedestrian in any direction.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3				3	1	2	2	3	3		2
CO2	3	3	3	2	3				3	1	2	2	3	3		2
CO3	3	2	2	2	3				3	1	2	2	2	3		2
CO4	2	2	2	2	2				3	1	2	2	3	3		3
CO5	2	2	2	2	3	2			3	1	1	2	1	3	3	3
CO6	2	2	2	2	2	2			3	1	2	2	1	3	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC66	DIGITAL COMMUNICATION LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites/Co requisites (CR):	12EC58 - Analog Communication Lab 12EC62 - Digital Coomunication (CR)					
Aim:	Adapt the student with the analysis and design of digital modulation and demodulation techniques.					
Course Objectives:	Enable the students to: • envisage the effects of sampling and TDM • implement PCM & DM • implement FSK, PSK, DPSK and QPSK schemes • analyze the performance of error correcting codes					
Course Outcomes:	1. Design and construct analog to digital conversion circuits. 2. Analyze the operation of time division multiplexing of band limited signals. 3. Examine the digital pulse modulation techniques. 4. Design various types of digital modulation and demodulation Circuits. 5. Perform the Bit Error Rate Analysis for different modulation schemes in Additive White Gaussian Noise channel using MATLAB. 6. Analyze the performance of different channels with error correcting codes.					

LIST OF EXPERIMENTS

1. Sampling theorem verification
2. TDM of two band limited signals
3. Delta Modulation and demodulation
4. PCM generation and detection
5. Differential Pulse Code Modulation and Demodulation.
6. Data formatting.
7. ASK generation and detection
8. FSK generation and detection
9. PSK generation and detection
10. DPSK generation and detection
11. QPSK generation and detection
12. Display of Eye Pattern
13. BER comparison of different modulation schemes in AWGN channel in MATLAB Simulink.
14. Performance analysis of different channels with error correcting codes.

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2					3	1	2	2	3	3		
CO2	3	3	2	2	2				3	1	1	2	3			
CO3	3	3	3	2	2	1			3	1	2	2	2	3		
CO4	3	3	1	2	3	1			3	1	2	2	2		2	1
CO5	3	3	2	2	2				3	1	2	2	3		2	
CO6	3	3	2	2	2	1			3	1	2	2	3	3		

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC67	COMPUTER NETWORKS LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites/ Corequisites (CR):	12EC64 - Computer Communication and Networks (CR)					
Course Objectives:	• To learn to communicate between two desktop computers. • To learn to implement the different protocols. • To be familiar with socket programming. • To be familiar with the various routing algorithms. • To be familiar with simulation tools.					
Course Outcomes:	1. Demonstrate the File transfer protocol is used to transfer data from one computer to another using internet. 2. Interpret the routing algorithms in network layer. 3. Explore the performance of stop and wait, Goback-N and selective repeat protocols. 4. Analyze the performance of Token bus and token ring protocols. 5. Experiment with encryption and decryption algorithms. 6. Analyze the transfering of files from PC to PC using Windows / UNIX socket processing					

LIST OF EXPERIMENTS

1. PC to PC Communication
   Parallel Communication using 8 bit parallel cable Serial communication using RS232C
2. Ethernet LAN protocol
   To create scenario and study the performance of CSMA/CD protocol through simulation
3. Token bus and token ring protocols
   To create scenario and study the performance of token bus and token ring protocols through simulation
4. Wireless LAN protocols
   To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
5. Implementation and study of stop and wait protocol
6. Implementation and study of Go back-N and selective repeat protocols
7. Implementation of distance vector routing algorithm
8. Implementation of Link state routing algorithm
9. Implementation of Data encryption and decryption
10. Transfer of files from PC to PC using Windows / UNIX socket processing

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3		1			3	1		2	3		3	2
CO2	3	3	2	2	2	2	2		3	1		2	3		2	2
CO3	3	3	2	2	2	1			3	1		2	2		1	2
CO4	3	2	2	2	2	1			3	1		2	2		2	2
CO5	3	2	2	3	2			2	3	1		2	2		1	2
CO6	3	2	1	2	2	1			3	1		2	3		3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12HS61	ENGLISH FOR EMPLOYMENT-II		L	T	P	C
			0	0	2	1
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Core					
Prerequisites:	12HS51 - English for Employment-I					
Aim:	To Improve learners Communication Skill in English with the Professional English Examination Module.					
Course Objectives:	• To impart Employment skill among the students. • To improve Technical vocabulary related to work place. • To develop students job prospects through oral communication.					
Course Outcomes:	1. Improve efficiency in reading skill. 2. Improve technical vocabulary related to work place. 3. Create effective technical written communication. 4. Develop listening skill to infer native speaker's communication. 5. Develop oral presentation skill. 6. Demonstrate personal ideas.					

A. Reading **4**

1. Reading for Gist
2. Reading for Structure and detail
3. Understanding General Points
4. Reading-Vocabulary and Texture
5. Structure and Discourse features
6. Understanding sentence structure

B. Writing **6**

1. Describing figure from graphic input
2. Deriving conclusion from illustrations
3. Writing a Report-Describing/Summarizing
4. Explaining a context
5. Writing Apologies
6. Writing for giving assurance

C. Listening **2**

1. Listening for Specific Information
2. Listening to Identify topic
3. Listening to a context
4. Listening to opinions expressed in a debate
5. Listening for Gist
6. Listening for making Inferences

D. Speaking **6**

1. 'Mini-Presentation' on the given topic
2. Group Discussion
3. Expressing personal opinion about the Social Issues

TOTAL:18 PERIODS

TEXT BOOKS

1. Business Benchmark Advanced Audio Cassettes BEC Higher, Guy Brook-Hart, 2 Audio cassettes, ISBN: 9780521672986
2. Business Benchmark Upper Intermediate Personal Study Book BEC and BULATS Edition, Guy Brook-Hart, PB, ISBN: 9780521672917

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2		2					2	3	3	3				
CO2						1	1	1	3	3	3	3				
CO3						1		1	3	3	3	3				
CO4				2			1		3	3	3	3				
CO5									3	3	3	3				
CO6				2		1	1	1	3	3	2	3				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC71	MICROWAVE AND RF SYSTEMS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Core					
Prerequisites:	12EC31 - Electronic Circuits I 12EC33 - Networks and Transmission Lines 12EC43 - Electromagnetic Fields and Waveguides 12EC61 - VLSI Design					
Aim:	Enable the student to explain microwave devices and wireless RF systems.					
Course Objectives:	To make the students to: • analyze the multi-port RF networks and RF transistor amplifiers • design impedance matching circuits • explain the active and passive microwave devices and components used in Microwave communication systems • generate Microwave signals and design microwave amplifiers • design wireless systems					
Course Outcomes:	1. Apply the microwave networks to scattering matrix and planar transmission line. 2. Design impedance matching circuits in transmission-line networks. 3. Clarify the operation of active, passive microwave circuits and microwave power sources. 4. Design RF radio systems for wireless communications using Diode mixers, SAW filters etc., 5. Elaborate small signal models and design RF circuits. 6. Illustrate RFID readers,tags, middleware architecture and summarize its applications					

UNIT I Z, Y AND S PARAMETERS AND PLANAR TRANSMISSION LINES 9

Impedance and Admittance matrices-reciprocal networks - Lossless networks-Scattering matrices-Generalized scattering matrix - Transmission matrix - Relation between impedance, admittance, scattering and transmission matrices. Planar transmission lines - Microstrip- Formula for effective dielectric constant, characteristic impedance and attenuation.

UNIT II IMPEDANCE MATCHING 9

Matching with lumped elements - Single stub and Double Stub matching - Analytic and Smith Chart solutions, Quarter wave Transformer-Tapered lines-Exponential taper-Triangular taper. Passive Microwaves circuits**:** Dividers and couplers- Three port networks- T Junction - Lossless divider –Resistive divider- branch line coupler-hybrid coupler-maximally flat low pass filter – stepped impedance filter.

UNIT III ACTIVE MICROWAVE CIRCUITS 9

Ferrite devices-Phase shifters-Isolator-circulator-Low noise amplifier-Mixers-Single ended mixers-Single Balanced mixers-Single pole switch-PIN diode switches-One port negative resistance oscillator. High power sources- Klystron-Magnetron-TWT-Low power source-GUNN, IMPATT, TRAPATT

UNIT IV WIRELESS RF SYSTEMS 9

Introduction to wireless systems – Design and performance issue –Wireless Antennas – Propagation and Fading – Power Amplifier – Diode Mixer – SAW Filters –Frequency Synthesizer – PLL Analysis – Oscillator Phase Noise – Receiver Architecture – Dynamic Range– Digital Cellular Receiver.

UNIT V RF CIRCUITS 9

Linearity & Distortion in RF Circuits –Intercept Points – Review of Technology - Bipolar transistors – current dependence – High frequency effects– Bipolar transistor design

considerations – CMOS transistors – NMOS – CMOS small signal models –Square Law Equations . Block Diagram of RFID – Readers – Tags – middleware – RFID Applications - Merits and Demerits.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. David M.Pozar, "Microwave Engineering", John Wiley & Sons, 2001
2. Annapurna Das & Sisir K.Das, "Microwave Engineering", Tata McGraw Hill, 2000.
3. John Rogers & Calvin Plett, "Radio Frequency Integrated Circuits", Artech House, 2003.

REFERENCE(S)

1. R.E.Collin, "Foundations of Microwave Engineering", McGraw Hill, 2007.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2	1						1	3	2	2	2
CO2	3	2	3	2	2	1						1	3	3	2	2
CO3	3	3	2	2	2							2	3	3	2	2
CO4	3	3	2	2	2							2	3	2	2	2
CO5	3	2	3	2	2	2						2	3	2	2	2
CO6	3	3	3	2	2	3						2	3	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC72	DSP ARCHITECTURE AND ITS APPLICATIONS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Core					
Prerequisites:	12EC53 - Digital Signal Processing					
Aim:	The purpose of this course is to expose the students to a class of DSP Architectures and to implement some typical applications.					
Course Objectives:	The objective of the course is to make the students to: • explain about DSP Processors • compare Architecture of Fixed Point DSPs and Floating Point DSPs • implement filters using processor • utilize Code Optimization Techniques for processor					
Course Outcomes:	1. Illustrate the architecture of 2100 family of processors and floating point & fixed point representation. 2. Develop FFT algorithms, FIR filters and IIR filters using ADSP. 3. Classify the architecture of TMS320C54X and C6X processors. 4. Make use of software tools - EVM and code composer studio to develop DSP algorithms. 5. Interpret the concepts of code optimization techniques. 6. Classify about frame processing and scheduling techniques.					

UNIT-I ADSP 21XX ARCHITECTURE AND PROGRAMMING 9

Introduction to ADSP- 2100 family of processors - Assembly language overview - Development systems - Single precision fixed point division - Multiprecision fixed point addition - subtraction - multiplication and division - Fixed point to floating point conversion and vice versa - Floating point addition - subtraction -multiplication and division-Sine-arctangent-square root and logarithm approximation - Uniform random number generation.

UNIT-II FFT AND FILTER IMPLEMENTATION USING ADSP 21XX 9

Implementation of FFT: Radix- 2 fast Fourier transforms - Block floating point scaling - Optimized radix- 2 DIT FFT-Leakage- Implementation of digital filters: single and double precision FIR Filters- IIR Filters - Multirate filters.

UNIT-III TMS320C6X ARCHITECTURE 9

Architecture of DSP chip TMS320C54x, TMS320C6X DSP chip CPU Operation - Pipelined CPU- VelociTI - C64x DSP- Software tools: EVM - DSK Target C6x board Assembly file - Memory management- Compiler utility- Code initialization - Code composer studio - Interrupt data processing.

UNIT-IV CODE OPTIMIZATION 9

Word-wide optimization - Mixing C and assembly- software pipelining - C64x improvements - Real time filtering – Circular buffering- Adaptive filtering.

UNIT-V FRAME PROCESSING, REAL TIME ANALYSIS AND SCHEDULING 9

Frame processing: DMA DSP Host Communication- DFT and FFT Implementation- Real time FFT - Real time analysis-Real time scheduling - real time data exchange - DSP / BIOS - Data synchronization and communication.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. "Digital Signal Processing Applications using the ADSP – 2100 Family", Volume 1 Analog devices, DSP Division Prentice Hall, 1992.

2. Nasser Kehtarnavaz and Mansour Keramat, "DSP System design using the TMS320C600", Prentice hall, 2001.

REFERENCE(S)

1. Sophocles J.Orfanidis,"Introduction to Signal Processing" , Prentice Hall,1998.
2. Sen M.Kuo ,Bob H.Lee, "Real – Time Digital Signal Processing- Implementations, Applications and Experiments with the TMS320C55x" , John Wiley and Sons, 2001.
3. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, 4th Edition, 2009.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2							2	3	2	3	3
CO2	3	3	2	2	2				2		2	2	3	2	3	3
CO3	3	3	2	3	2							2	2	2	2	3
CO4	3	3	2	2	2	2			2			2	3	2	3	3
CO5	3	3	2	1	2	3			2			2	2	2	2	3
CO6	3	3	2	1	2	2			2			3	3	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC73	WIRELESS COMMUNICATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category	Core					
Prerequisites:	12EC61 - Digital Communication					
Aim:	To study and analyze the Wireless communication systems.					
Course Objectives:	• To study the concepts of wireless communication using cellular environment. • To study the various modulation techniques, propagation methods, signal processing techniques used in the mobile communication.					
Course Outcomes:	1. Classify the wireless networks and cellular concepts such as frequency reuse, handoff, interference and problems in frequency reuse. 2. Analyze large scale path loss in Propagation mechanisms and summarize about Wireless Standards. 3. Estimate the small scale radio propagation models and predict their effects. 4. Apply the modulation techniques to mobile radio. 5. Perform SNR and BER analysis and summarize the Equalization and diversity techniques. 6. Analyze channel coding and Speech coding techniques					

UNIT-I MODERN WIRELESS COMMUNICATION SYSYTEMS 9

Introduction to Wireless Communication Systems, 2Gand 3G Wireless Networks, WLL, LMDS, WLAN, Bluetooth and PAN, Principles of Cellular networks- Frequency reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grading of Service, Improving coverage and capacity and cellular systems.

UNIT-II LARGE SCALE PATH LOSS & WIRELESS STANDARD 9

Free Space Propagation, Relating Power to Electric Field, Three Basic Propagation Mechanisms – Reflection, Diffraction and Scattering, Ground Reflection Model**,** Wireless Standard – GSM, IS 95

UNIT-III SMALL SCALE FADING AND MULTIPATH PROPAGATION 9

Small Scale Multipath propagation, Parameters of mobile multipath channels, types of small scale fading, Rayleigh and Rician Distributions, Clarke's Model for flat fading

UNIT-IV MODULATION TECHNIQUES FOR MOBILE RADIO 9

Modulation and demodulation – Quadrature Phase Shift Keying, π/4-Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Spread Spectrum Modulation Techniques – DS-SS, FH-SS, Modulation Performance in Fading and multipath channels

UNIT-V SIGNAL PROCESSING IN WIRELESS SYSTEMS 9

Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Rappaport. T.S.,"Wireless communications",Pearson Education, 2009
2. Andreas.F. Molisch, "Wireless Communications", John Wiley , 2nd Edition- India, 2006.

REFERENCE(S)

1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd.,3rd Edition , 2011.
3. Simon Haykins & Michael Moher, "Modern Wireless Communications", Pearson Education, 3rd Edition, 2007.

4. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007, http:// books.elsevier.com/9780123735805.
5. Van Nee, R. and Ramji Prasad, "OFDM for wireless multimedia communications", Artech House, 2000.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2	2	3	2					3	3		3	1
CO2	3	3	2	2	2	1	2					3	3		3	
CO3	3	3	2	2	2	1	2					3	3		3	
CO4	3	2	3	2	2	3						3	3		2	
CO5	3	2	1	2	3	3	2					2	3		1	2
CO6	3	2	2	3	3	1	2					3	3		2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC74	FIBER OPTIC COMMUNICATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Core					
Prerequisites:	12EC33 - Networks and Transmission lines 12EC62 - Digital Communication					
Aim:	To introduce the various optical fiber modes, configurations, various signal degradation factors associated with optical fiber, optical sources and optical detectors and their use in the optical communication system. Finally to discuss about digital transmission and its associated parameters on system performance.					
Course Objectives:	• To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures. • To classify the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. • To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers. • To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration. • To learn WDM & CDMA concepts in optical communication.					
Course Outcomes:	1. Develop the basic elements of optical fiber transmission link, Fiber modes configurations and structures. 2. Classify the different fiber optical sources and photo detectors. 3. Analyze the modulation techniques for Fiber Optic Communication. 4. Categorize optical transmission media and detectors. 5. Classify the basic SONET/SDH, WDM & CDMA concepts in optical networks. 6. Illustrate ultra high capacity networks and optical networking technology in enterprise.					

UNIT-I INTRODUCTION TO OPTICAL FIBERS 9

Review of Electrical communication systems - Need for optical communication. Electrical and Optical communication -Advantages and applications - EM spectrum - system model description - Selection of system components - choice of operating wave length - System performance .Mode theory of Circular Wave guides - Overview of Modes - Key Modal concepts - Linearly Polarized Modes - Single Mode Fibers - Graded Index fiber structure, Losses in optical fibers.

UNIT-II FIBER OPTICAL SOURCES & PHOTO DETECTORS 9

Characteristics and requirements - Spontaneous and stimulated emission - Source classifications: Ruby, He-Ne lasers, Homo & Hetero structures, Laser Diodes and LED's characteristics, Comparison and applications - Physical principles of Photodiodes, Photo detector Noise, Detector response time - Avalanche multiplication Noise - Comparisons of photo detectors.

UNIT-III MODULATION TECHNIQUES 9

Classifications, Direct/Internal modulation: Analog and Digital modulation formats-External modulators: Electro-optic and Acousto - optic modulators.

UNIT-IV TRANSMISSION MEDIA & OPTICAL RECEIVERS 9

Fiber-optics Vs Coaxial cables - Optical fiber modes and configurations - Fiber transmission properties-Choice of wave length for fiber-optic transmission - Cable configurations - Splices, connectors and couplers - Requirements - Methods of detection process - Comparison - Basic principles of photo detection - Photo diode - Avalanche photo multiplier - Receiver configurations - Pre amplifiers for detectors.

UNIT-V SYSTEM CONFIGURATIONS AND FIBER OPTIC APPLICATIONS 9

Laser radar system - Fiber optic link for computers - Multichannel audio/video communication systems- Repeater/Regenerator for fiber-optic systems -Power Budget and Rise-time Budget- Basic networks - SONET/SDH - WDM concepts and components - Optical CDMA - generation of optical fiber link - Introduction to Ultra High Capacity Networks - optical networking technology in enterprise.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Optical Fiber Communication – John M. Senior – Pearson Education – SecondEdition. 2007
2. Keiser G, "Optical Fiber Communications", McGraw Hill, New Delhi, 3rd edition, 2001.

REFERENCE(S)

1. Franz J.H. Jain V.K, "Optical Communication, Components and systems", Narosa publications,New Delhi, 2000.
2. K. Mynbaev and Lowell L Scheiner, "Fiber Optic Communication Technology", Pearson Education Asia, New Delhi, 2001.
3. Gower, J "Optical Communication Systems", PHI, New Delhi, 2nd edition, Fifth reprint,1995.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2	2						2	3	2	1	2
CO2	3	2	3	2	2	3						2	3	2	2	2
CO3	3	3	3	2	2	2						2	2	2	2	2
CO4	3	2	3	2	2	2						2	2	2	2	2
CO5	3	3	3	2	2	3						2	2	2	3	2
CO6	3	3	3	2	2	2						2	2	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC75	MICROWAVE AND OPTICAL LABORATORY		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering.	**Sem:**	VII			
Category:	Core					
Prerequisites/ Corequisites (CR):	12EC54 - Antenna and wave Propagation 12EC71 - Microwave and RF Systems (CR)					
Aim:	Enable the student to demonstrate the active and passive microwave devices used in Microwave and optical communication systems.					
Course Objectives:	To make the students to: • explain the working principle of optical sources, detector, fibers and microwave components • analyze the radiation of pattern of antenna • analyze the mode characteristics of fiber • analyze the performance of simple optical link • test microwave and optical components					
Course Outcomes:	1. Analyze the characteristics of microwave sources and measure VSWR, Frequency and Wavelength. 2. Deduct S parameter for different microwave devices and components. 3. Formulate and plot the gain and radiation pattern of Antenna. 4. Analyze the DC characteristics of LED and PIN Photo diodes. 5. Demostrate Mode characteristics, losses, Numerical Aperture & attenuation of Fibers. 6. Design fiber optic analog and digital Links.					

LIST OF EXPERIMENTS

Microwave Experiments:

1. Reflex Klystron – Mode characteristics
2. Gunn Diode – Characteristics
3. VSWR, Frequency and Wave Length Measurement
4. Directional Coupler – Directivity and Coupling Coefficient – S – parameter measurement
5. Isolator and Circulator – S - parameter measurement
6. Attenuation and Power measurement
7. S - matrix Characterization of E-Plane T, H-Plane T and Magic T.
8. Radiation Pattern of Antennas.
9. Antenna Gain Measurement

Optical Experiments:

1. DC characteristics of LED and PIN Photo Diode.
2. Mode Characteristics of Fibers
3. Measurement of Connector and Bending Losses.
4. Fiber Optic Analog and Digital Link
5. Numerical Aperture Determination for Fibers
6. Attenuation Measurement in Fibers

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2				3	1	1	2	3	2	3	2
CO2	3	2	3	2	2				3	1	1	2	3	3	3	2
CO3	3	2	3	2	2	1			3	1	1	2	3	2	3	2
CO4	3	2	3	2	2	1			3	1	1	2	3	2	3	2
CO5	3	2	3	1	2	1			3	1	1	2	3	2	2	2
CO6	3	2	3	1	2	1			3	1	1	2	3	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC76	SIGNAL PROCESSORS LAB		L	T	P	C
			0	0	3	2
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Core					
Prerequisites/ Corequisites (CR):	12EC53 - Digital Signal Processing 12EC72 - DSP Architecture and its Applications (CR)					
Aim:	The purpose of this course is to develop skills of the students in implementing Digital signal Processing techniques using Processors.					
Course Objectives:	• To make the students interpret the architecture of Digital Signal Processors. • To make them develop DSP algorithms in processors. • To make them construct the code optimization techniques.					
Course Outcomes:	1. Interpret the architecture of Digital Signal Processors. 2. Experiment with Integrated Development Environment (Code Composer Studio) for Digital Signal Processor. 3. Design algorithms of Digital Signal Processing Techniques like convolution and Fourier Transform. 4. Analyze the different types of filters using ADSP processor. 5. Build adaptive filtering technique for noise cancellation. 6. Construct multirate filters.					

LIST OF EXPERIMENTS

1. To study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
2. Study of addressing modes of DSP
3. Generation of sine, square and triangular waveforms
4. Implementation of linear convolution.
5. Implementation of circular convolution.
6. Sampling of input signal and display
7. Implementation of FIR filter
8. Implementation of IIR filter
9. Implementation of Radix – 2 FFT using ADSP 21XX processor.
10. Adaptive filter for noise cancellation
11. Implementation of Multirate signal processing – Decimation filter
12. Implementation of Multirate signal processing – Interpolation filter

(**Note**: Experiments may be done using any one of the TMS320C5X/ TMS320C67XX/ ADSP21XX family of processors)

TOTAL: 45 PERIODS

Evaluation Criteria & Marks	Internal (25)			End Semester Examination	Total Marks
	Observation (45%)	Record (45%)	Attendance (10%)		
	10	10	5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2				3	1	2	2	3	2	3	3
CO2	3	3	3	3	2				3	1	2	2	3	2	3	3
CO3	3	3	3	2	2				3	1	2	2	2	2	3	3
CO4	3	3	3	3	2				3	1	2	2	3	2	3	3
CO5	3	3	3	2	2				3	1	2	2	3	2	3	3
CO6	3	3	3	3	2	2			3	1	2	2	3	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC81 **PROJECT WORK** **L T P C**

0 0 12 6

Programme: B.E Electronics and Communication Engineering **Sem: VIII**

Aim: To develop a simplified electronics and communication model suitable for any application.

COURSE OUTCOME:

1. Make use of new tools and apply it.
2. Create new ideas for solving problems.
3. Schedule the works under different persons. (project Management skills)
4. Develop the skill to communicate effectively and demonstrate the work.
5. Develop an ability to analyze critically and write it.
6. Work as an individual and as a team.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	1		2	3	1	2	2	3	3	3	3
CO2	3	3	3	3	2	2	2		3		2	2	3	3	3	3
CO3	3	2			2	2	1	2	3	3	3	2	2	2	2	2
CO4	3	2	2	1	1			2	3	3	3	2	2	2	2	2
CO5	3	3	2	2	2				3		3	2	3	3	3	3
CO6						1			3	2	3	1	3	2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12MA61	NUMERICAL METHODS FOR ENGINEERING APPLICATIONS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Elective					
Prerequisites:	12MA31 - Transforms and Partial differential Equations					
Aim:	To develop efficient algorithms for solving problems in Engineering and Technology.					
Course Objectives:	• To solve the Eigen values of a matrix. • To find the intermediate values from the data by interpolation method. • Use Milne's predictor-corrector methods for solving first order equations.					
Course Outcomes:	1. Characterize Newton-Raphson method. 2. Evaluate matrix Inverse by using Gauss-Jordan method. 3. Apply Newton's forward and backward difference interpolation. 4. Discover Numerical integration using Trapezoidal and Simpson's 1/3 rules. 5. Analyse the Modified Euler's method. 6. Develop Finite difference solution of Second order Equation.					

UNIT-I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

Solution of equation –Fixed point iteration: x=g(x) method - Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordon method– Iterative method -Gauss-Seidel method - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

UNIT-II INTERPOLATION AND APPROXIMATION 9

Lagrangian Polynomials –Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

UNIT-III NUMERICAL DIFFERENTIATION AND INTERGRATION 9

Differentiation using interpolation formulae – Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method - Two and Three point Gaussian Quadrature formulae - Double integrals using Trapezoidal and Simpson's rules

UNIT-IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step methods: Taylor series method - Euler and modified Euler methods Fourth order Runge - Kutta methods for solving first and second order equations- Multistep methods: Milne's and Adam's predictor and corrector methods

UNIT-V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference methods for solving second order ordinary differential equation- Finite differences solution of one dimensional heat equation by explicit and implicit methods - One dimensional wave equation and two dimensional Laplace and Poisson equations

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Veerarjan, T and Ramachandran, T. 'Numerical methods with programming in 'C'Second Editiion, Tata McGraw-Hill Publishing.Co.Ltd. (2007).
2. Sankara Rao K, 'Numerical Methods for Scientisits and Engineers' – 3rd edition Printice Hall of India Private Ltd, New Delhi, (2007).

REFERENCE(S)

1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P.O., "Applied Numerical Analysis", 6th Edition, Pearson

Education Asia, New Delhi, 2006.
3. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3								3	2	2	1	2
CO2	2	3	2	2								1	2	2	1	2
CO3	2	2	2	2								2	2	2	2	2
CO4	2	2	2	3								2	2	2	1	2
CO5	2	2	2	2								1	2	2	2	2
CO6	2	2	2	2								1	2	2	1	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC6A	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Elective					
Prerequisites:	12F2X5 - Electric Circuits and Electron Devices					
Aim:	To make the students apply the concept of electronic instrumentation and measurements techniques.					
Course Objectives:	To make the students to: • apply the basic laws governing the operation of the instruments, relevant circuits and their working • classify the signal generators & analyzers • analyze digital instruments, error, calibration etc • construct data acquisition system					
Course Outcomes:	1. Demonstrate the basic working principles of various instrumentations. 2. Measure the analog meters and CROs. 3. Testing the signal generators and analyzers. 4. Measure the frequency and time interval of signals using digital Instruments and calibrate the errors. 5. Develop computerized instrumentation systems for industrial processes using multiple sensors, interface electronics, data acquisition card, PIB and serial instruments. 6. Discuss the Fiber optic measurements for power and system loss					

UNIT-I BASIC MEASUREMENT CONCEPTS 9

Measurement systems – Static and dynamic characteristics – units and standards of measurements – error analysis- moving coil, moving iron meters – multimeters – True RMS meters.Bridge measurements : – Maxwell, Hay, Schering, Anderson and Wien bridge.

UNIT-II BASIC ELECTRONIC MEASUREMENTS 9

Electronic multimeters – Cathode ray oscilloscopes – block schematic – applications –special oscilloscopes – Q meters – Vector meters – RF voltage and power measurements.

UNIT-III SIGNAL GENERATORS AND ANALYZERS 9

Function generators – pulse and square wave generators, RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer.

UNIT-IV DIGITAL INSTRUMENTS 9

Comparison of analog and digital techniques – digital voltmeter – multimeters – frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors.

UNIT-V DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENT 9

Elements of a digital data acquisition system – interfacing of transducers – multiplexing – computer controlled instrumentation – IEEE 488 bus – fiber optic measurements for power and system loss – optical time domains reflectometer

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Albert D.Helfrick and William D.Cooper – Modern Electronic Instrumentation and Measurement Techniques, Pearson / Prentice Hall of India, 2007.

REFERENCE(S)

1. David A. Bell, Electronic Instrumentation And Measurements, Prentice Hall Of India Pvt Ltd,

2003.
2. B.C. Nakra and K.K. Choudhry, Instrumentation, Meaurement and Analysis, 2ndEdition, TMH, 2004.
3. S.Ramabhadran, Electronics Measurements And Instruments,Second Edition Khanna Publishers,Delhi,2003
4. H.S.Kalsi, Electronic Instrumentation, Tata Mc Graw Hill Publications,New DELHI,2003
5. M.M.S.Anand, Electronics Instrumentation Technology, Prentice Hall Of India.
6. A.J.Bowense, Digital Intruments, Tata Mcgraw-Hill Publishing Company Limited.

Evaluation Criteria & Marks	Continuous Assessment (20)		End Semester Examination	Total Marks
	Assess.Tests (75%)	Assign/Seminar/ Attendance (25%)		
	15	5	100 [Min Pass: 50]	100 [Min Pass: 50]
Attendance Mark	91% and above – 5, 86-90% - 4, 81-85% - 3, 76-80% - 2 75% - 1			
Grade Criteria	S(91-100), A(81-90), B(71-80), C(61-70), D(57-60), E(50-56), U (<50)-Fail			

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1								1	3	3		2
CO2	3	3	2	1	3							2	2	3	2	2
CO3	3	2	1	3	3	1						2	2	3	2	2
CO4	1	3	2	3	2							2	2	3	2	2
CO5	3	2	3	2	3	1						3	2	3	2	3
CO6	3	2	2	2	2	1						1	2	3	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC6B	TV AND VIDEO ENGINEERING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Elective					
Prerequisites:	12EC55 - Analog Communication					
Aim:	The syllabus aims at a comprehensive coverage of Television Systems with all the new developments in Television Engineering.					
Course Objectives:	• To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes. • To study the principles of Monochrome Television Transmitter and Receiver systems. • To study the various Color Television systems with a greater emphasis on PAL system. • To study the advanced topics in Television systems and Video Engineering.					
Course Outcomes:	1. Construct the picture tubes and Television Camera Tubes using composite Video Signal. 2. Create the monochrome Television Transmitter and Receiver systems. 3. Identify the functionality of color television picture tubes. 4. Compare the TV standards with greater emphasis on PAL system. 5. Elaborate cable signal processing. 6. Demonstrate the concepts of digital television, 3D TV, EDTV, and others.					

UNIT-I FUNDAMENTALS OF TELEVISION 9

Aspect ratio-image continuity- number of scanning lines-interlaced scanning- picture resolution- camera tubes- image orthicon- vidicon- plumbicon- silicon diode array vidicon-solid state image scanners- monochrome picture tubes- composite video signal- video signal dimension- horizontal sync. Composition – vertical sync. Details-functions of vertical pulse train- scanning sequence details. Picture signal transmission- positive and negative modulation-VSB transmission- sound signal transmission-standard channel bandwidth.

UNIT-II MONOCHROME TELEVISION TRANSMITTER AND RECEIVER 9

TV transmitter-TV signal propagation- interference- TV Transmission antennas- monochrome TV receiver- RF tuner-UHF – VHF tuner- digital tuning techniques- aft- IF subsystems- AGC noise cancellation- video amplifier circuits- sync operation- typical sync processing circuits – deflection oscillators- frame deflection circuits- requirements- line deflection circuits- EHT generation- receiver antennas.

UNIT-III ESSENTIALS OF COLOUR TELEVISION 9

Compatibility- colour perception- three colour television cameras- values of luminance and colour difference signals- colour television display tubes- delta- gun precision-in-line and Trinitron colour picture tubes- purity and convergence- purity and static and dynamic convergence adjustments- pincushion-correction techniques- automatic degaussing circuits-gray scale tracking- colour signal transmission- bandwidth- modulation of colour difference signals- weighting factors- formation of chrominance signal.

UNIT-IV COLOUR TELEVISION SYSTEMS 9

NTSC colour TV systems- SECAM system- PAL colour TV systems- cancellation of phase errors- PAL-D colour system-PAL coder- PAL- decoder receiver- chromo signal amplifier-separation of U and V signals- colour burst separation- burst phase discriminator- acc amplifier-reference oscillator- ident and colour killer circuits- U and V demodulators- colour signal matrixing. Sound in TV

UNIT-V ADVANCED TELEVISION SYSTEMS 9

Satellite TV technology- geo stationary satellites- satellite electronics- domestic broadcast system- cable TV – cable signal sources- cable signal processing, distribution and scrambling-video recording- VCR electronics- video home formats- video disc recording and playback-

DVD players- tele text signal coding and broadcast receiver- digital television- transmission and reception- projection

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. "R.R.Gulati, "Monochrome Television Practice, Principles, Technology And Servicing" 3rd Edition 2006, New Age International (P) Publishers.
2. R.R.Gulati, "Monochrome & colour Television", New Age International (P) Publishers, 2003.

REFERENCE(S)

1. A.M Dhake, "Television and video Engineering", 2nd Edition., TMH, 2003

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	1							2	2	2	2	2
CO2	3	3	2	2	2							2	2	2	2	2
CO3	3	2	2	2	2							2	2	2	2	2
CO4	3	2	2	2	2							2	2	2	2	
CO5	3	2	2	2	3							2	2	2	3	
CO6	3	2	2	2	3							2	2	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC6C	ACOUSTICS ENGINEERING		L	T	P	C
			3	0	0	3
Programme:	B.E Electronics and Communication Engineering	**Sem:**	VI			
Category:	Elective					
Prerequisites:	12F2Z3 - Engineering Physics II					
Aim:	This course aims to provide an overview of engineering acoustics.					
Course Objectives:	• To study the mathematical basis for acoustics waves. • To introduce the concept of radiation reception absorption and attenuation of acoustic waves. • To present the characteristic behavior of sound in pipes, resonators and filters. • To describe the architecture and environmental inclusive of reverberation and noise. • To give a detailed study on loud speakers and microphones.					
Course Outcomes:	1. Illustrate the principles of acoustics. 2. Demonstrate the radiation and reception of Acoustic waves. 3. Analyze the importance of protecting the community from excessive noise and how it damages the hearing mechanism. 4. Elaborate the architecture and environmental inclusive of reverberation and noise. 5. Estimate the sound fields in rooms and how they may be controlled. 6. Compare the different types of receivers.					

UNIT-I ACOUSTICS WAVES 9

Acoustics waves - Linear wave equation sound in fluids Harmonic plane waves Energy density Acoustics intensity Specific acoustic impedance spherical waves Describer scales.

Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence method of images

UNIT-II RADIATION AND RECEPTION OF ACOUSTIC WAVES 9

Radiation from a pulsating sphere Acoustic reciprocity continuous line source - radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound Absorption from viscosity complex sound speed and absorption classical absorption coefficient

UNIT-III PIPES RESONATORS AND FILTERS 9

Resonance in pipes - standing wave pattern absorption of sound in pipes long wavelength limit Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters low pass, high pass and band pass.

Noise, Signal detection, Hearing and speech

Noise, spectrum level and band level combing band levels and tones detecting signals in noise detection threshold the ear fundamental properties of hearing loudness level and loudness pitch and frequency voice.

UNIT-IV ARCHITECTURAL ACOUSTICS 9

Sound in endosure A simple model for the growth of sound in a room reverberation time - Sabine, sound absorption materials measurement of the acoustic output of sound sources in live rooms acoustics factor in architectural design.

Environmental Acoustics:

Weighted sound levels speech interference highway noise noise induced hearing loss noise and architectural design specification and measurement of some isolation design of portions.

UNIT-V TRANSDUCTION 9

Transducer as an electives network canonical equation for the two simple transducers transmitters moving coil loud speaker loudspeaker cabinets horn loud speaker, receivers condenser microphone moving coil electrodynamics microphone piezoelectric microphone calibration of receivers.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Lawrence E.Kinsler,Austin, R.Frey, Alan B.Coppens, James V.Sanders, Fundamentals of Acoustics, 4th edition, Wiley, 2000.

REFERENCE(S)

1. L.Beranek , "Acoustics" - Tata McGraw-Hill

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2								2	2		2	
CO2	3	3	2	3	2							2	2		2	
CO3	3	3	2	2	2	2						2	2		2	
CO4	3	3	2	2		1	2					2	2		2	
CO5	3	2	2	2	2	2						2	2		2	
CO6	2	2	2	3								2	2	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC6D	PCB DESIGN AND TESTING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Elective					
Prerequisites:	12EC42 - Linear Integrated Circuits and Applications 12EC61 - VLSI Design					
Aim:	The aim of this course is to develop skills in PCB designing and testing.					
Course Objectives:	• To make the students define the basics of Printed circuit boards. • To make them experiment with the layout planning and design. • To make them illustrate the design considerations for special circuits.					
Course Outcomes:	1. Design modern PCBs. 2. Design and develop layout of PCB using PCB layout design tool with fabrication. 3. Apply the design technique and analyze the electrical characteristics of VLSI circuits. 4. Make use of CAD software to prepare drawings, standards, and processes required to layout Printed Circuit Boards. 5. Classify the multichip packages and techniques. 6. Illustrate the design and construction of flexible printed circuit boards.					

UNIT-I BASICS OF PRINTED CIRCUIT BOARDS 9

Connectivity in Electronic Equipment – Advantages of Printed Circuit Boards, Evolution of Printed Circuit Boards, Components of a Printed Circuit Board , Classification of Printed Circuit Boards- Single-sided Printed Circuit Boards- Double-sided Printed Circuit Boards- Multi-layer Boards- Rigid and Flexible Printed Circuit Boards, Manufacturing of Basic Printed Circuit Boards- Single-sided Boards- Double-sided Plated Through-holes - Multi-layer Boards – Flexible Boards, Challenges in Modern PCB Design and Manufacture , Major Market Drivers for the PCB Industry, PCBs with Embedded Components, Standards on Printed Circuit Boards, Useful Standards

UNIT-II LAYOUT PLANNING AND DESIGN 9

Reading Drawings and Diagrams, Mechanical Design Considerations , Electrical Design Considerations, Conductor Patterns, Component Placement Rules, Fabrication and Assembly Considerations, Environmental Factors, Cooling Requirements and Packaging Density, Layout Design, Layout Design Checklist, Documentation- Documentation File, Useful Standards

UNIT-III DESIGN CONSIDERATIONS FOR SPECIAL CIRCUITS 9

Design Rules for Analog Circuits, Design Rules for Digital Circuits, Design Rules for High Frequency Circuits, Design Rules for Fast Pulse Circuits, Design Rules for PCBs for Microwave Circuits,Electromagnetic Interference/Compatibility(EMI/EMC)

UNIT-IV ARTWORK GENERATION 9

Basic Approach to Manual Artwork, General Design Guidelines for Artwork Preparation ,Artwork Generation Guidelines, Film Master Preparation,Automated Artwork Generation, Computer- Aided Design (CAD),Basic CAD Operation,DesignAutomation,Manual Versus Automation in PCB Design,Photoplotter,Computer-Aided Manufacturing (CAM),Data Transfer Mechanisms,PCB Design Checklist

UNIT-V MULTI-LAYER BOARDS AND FLEXIBLE PCBS 9

Interconnection Techniques, Materials for Multi-layer Boards,Design Features of Multi-layer Boards, Fabrication Process for Multi-layer Boards, Construction of Flexible Printed Circuit Boards, Design Considerations in Flexible Circuits, Manufacture of Flexible Circuits,Rigid Flex Printed Circuit Boards,Terminations,Advantages of Flexible Circuits, Special Applications of Flexible Circuits

TOTAL: 45 PERIODS

REFERENCE(S)

1. Dr R.S.Khandpur, "Printed Circuit Boards – Design, Fabrication,Assembly and Testing", McGraw-Hill.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	1						2		3		2
CO2	3	3	3	2	2							2		3		2
CO3	3	2	3	2	2							2		2		2
CO4	3	2	3	2	2							2		3		2
CO5	3	2	2	2	2	1						2		2		3
CO6	3	2	2	2	2	1						2		3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC6E	DATABASE MANAGEMENT SYSTEMS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VI			
Category:	Elective					
Prerequisites:	12F1Z5 - Computing Fundamentals and C Programming 12EC34 - Data Structures and C++					
Aim:	The aim of the course is to make the students design and implement database systems and applications.					
Course Objectives:	The course objectives are to make the students to: • explain the fundamentals of data models and to conceptualize and depict a database system using ER diagram • illustrate about the SQL and relational database design • summarize the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure					
Course Outcomes:	1. Differentiate database systems from file systems. 2. Illustrate the fundamentals of data models and to conceptualize and depict a database system using ER diagram 3. Classify SQL and construct queries using SQL. 4. Build the relational database schema using DBMS. 5. Analyze the basic issues of transaction processing and Concurrency control. 6. Identify the issues related to Indexing and Hashing.					

UNIT-I INTRODUCTION 9

Purpose of Database System – Views of data – Data Models – Database Languages – Database System Architecture – Database users and Administrator – Entity– Relationship model – E-R Diagrams – Introduction to relational databases.

UNIT-II RELATIONAL MODEL 9

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals - Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views.

UNIT-III DATABASE DESIGN 9

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form- Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT-IV TRANSACTIONS 9

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery – Concurrency – Need for Concurrency.

UNIT-V IMPLEMENTATION TECHNIQUES 9

Overview of Physical Storage Media – Magnetic Disks – RAID – Tertiary storage – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database SystemConcepts”, Fifth Edition, Tata McGraw Hill, 2006.
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

REFERENCES

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth

Edition , Pearson / Addisionwesley, 2007.
2. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGrawHill, 2003.
3. S.K.Singh, "Database Systems Concepts, Design and Applications", First Edition, Pearson Education, 2006.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1								2				2
CO2	2	1	1	1	1							1				2
CO3	3	2	1	2	2							2				2
CO4	3	2	2	2	2							2				2
CO5	3	1	2	2	2							2				2
CO6	3	2	2	2	2	2						2				2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12MG52	PRINCIPLES OF MANAGEMENT		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category :	Elective					
Prerequisites:	---					
Aim:	To familiarize students with the basic management concepts and theories.					
Course Objectives:	To make the students to: • explain the differing approaches to defining management and the standard cycle of the management process • examine how a manager can add value to an organization • analyze the leadership styles of managers • examine what and how to motivate your employees • apply leadership and motivation theories • describe the use of roles when working as a team					
Course Outcomes:	1. Demonstrate knowledge of managerial functions, types of managers, an evolution of management theory, managerial roles and skills. 2. Elaborate the different approaches to define management and the standard cycle of the management process 3. Illustrate the elements of planning, goal setting, controlling, and the decision making process. 4. Analyze organizational structure, organizational control, career development and training. 5. Identify the various theories related to the development of leadership skills, motivation techniques, teamwork and effective communication. 6. Analyze both qualitative and quantitative information to isolate issues and formulate.					

UNIT-I OVERVIEW OF MANAGEMENT 9

Organization – Management – Role of managers – Evolution of Management thought – Organization and the environmental factors – Managing globally – Strategies for International Business.

UNIT-II PLANNING 9

Nature and purpose of planning – Planning process – Types of plans – Objectives - -Managing by objective (MBO) Strategies – Types of strategies – Policies – Decision Making – Types of decision – Decision Making Process – Rational Decision Making Process – Decision Making under different conditions.

UNIT-III ORGANIZING 9

Nature and purpose of organizing – Organization structure – Formal and informal groups *I* organization – Line and Staff authority – Departmentation – Span of control –Centralization and Decentralization – Delegation of authority – Staffing – Selection and Recruitment – Orientation – Career Development – Career stages – Training - -Performance Appraisal.

UNIT-IV DIRECTING 9

Creativity and Innovation – Motivation and Satisfaction – Motivation Theories Leadership – Leadership theories – Communication – Hurdles to effective communication –Organization Culture – Elements and types of culture – Managing cultural diversity.

UNIT-V CONTROLLING 9

Process of controlling – Types of control – Budgetary and non-budgetary control techniques – Managing Productivity – Cost Control – Purchase Control – Maintenance Control – Quality Control – Planning operations.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.

REFERENCE(S)

1. Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', Thomson South Western, 10th edition, 2007.
2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management – A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1							1			3	3	3				
CO2				1		2	2	3	3	2	3	3				
CO3				1		2	2	3	3	2	3	3				
CO4						2	3	3	3	3	3	3				
CO5						2	2			3	3	3				
CO6						2	2	2	2	2	2	3				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7A	SOFTWARE ENGINEERING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category :	Elective					
Prerequisites:	---					
Aim:	The systematic Approach to the design, development, operation, and maintenance of a software system.					
Course Objectives:	To make the students to • state the software process • analyze the functional and non functional software requirements • apply real time software design concepts and principles • develop the software testing • prepare software project management					
Course Outcomes:	1. Plan and deliver an effective software engineering process, based on knowledge of widely used development lifecycle models. 2. Translate the requirements specification into an implementable design with software prototyping, structured and organized process. 3. analyze the functional and non functional software requirements. 4. Design and analyze complex real time systems. 5. Formulate testing strategies for software systems. 6. Evaluate the quality of the requirements, analyze and design work done during the module.					

UNIT-I SOFTWARE PROCESS 9

Introduction -S/W Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) - system engineering - computer based system - verification - validation - life cycle process -development process - system engineering hierarchy.

UNIT-II SOFTWARE REQUIREMENTS 9

Functional and non-functional - user - system -requirement engineering process - feasibility studies - requirements – elicitation -validation and management - software prototyping - prototyping in the software process - rapid prototyping techniques -user interface prototyping -S/W document. Analysis and modeling - data, functional and behavioral models – structured analysis and data dictionary.

UNIT-III DESIGN CONCEPTS AND PRINCIPLES 9

Interface design - user Interface design principles. Real time systems - Real time software design - system design - real time executives - data acquisition system - monitoring and control system. SCM - Need for SCM - Version control - Introduction to SCM process - Software configuration items.

UNIT-IV TESTING 9

Taxonomy of software testing - levels - test activities - types of s/w test - black box testing - testing boundary conditions -structural testing - test coverage criteria based on data flow mechanisms - regression testing - testing in the large. S/W testing strategies - strategic approach and issues - UNIT testing - integration testing - validation testing - system testing and debugging.

UNIT-V SOFTWARE PROJECT MANAGEMENT 9

Measures and measurements - S/W complexity and science measure - size measure - data and logic structure measure – information flow measure. Software cost estimation - function

point models - COCOMO model- Delphi method.- Defining a Task Network - Scheduling - Earned Value Analysis - Error Tracking - Software changes - program evolution dynamics – software maintenance - Architectural evolution , Taxonomy of CASE tools.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Roger S.Pressman, "Software Engineering - A Practitioner's Approach", McGraw-Hill International Edition, 6th Edition, 2006.

REFERENCE(S)

1. Ian Sommerville, "Software Engineering", Pearson education Asia, 8th Edition, 2007.
2. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
3. James F Peters and Witold Pedryez, "Software Engineering - An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
4. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 1996.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3						2			2	3	3				2
CO2	3				1		1			1	3	3				2
CO3	3	3	2	1	2		2		1	1	3	3				2
CO4	3	3	2	1	2		2		1	1	3	3				2
CO5	3	2	1		1		1		1		1	3				2
CO6	1		2	1			1		1	1	1	3				2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7B	DIGITAL IMAGE PROCESSING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category :	Elective					
Prerequisites:	12EC53 - Digital Signal Processing					
Aim:	To study and process the digital images in spatial and frequency domain.					
Course Objectives:	• To study the properties and representation of various digital images. • To study the enhancement and restoration of digital images in spatial and frequency domain. • To study the analysis of various thersholding and segmentation algorithms.					
Course Outcomes:	1. Summarize the basic concepts of sampling, quantization, neighboring pixels, adjacency and connectivity. 2. Apply the various transforms and their properties into a digital image. 3. Compare and contrast the image enhancement using spatial domain and frequency domain. 4. Identify the image restoration model and different noise models. 5. Analyze compression techniques and its standards. 6. Identify the methods of image segmentation.					

UNIT-I DIGITAL IMAGE FUNDAMENTALS 9

Fundamentals and Components of digital image processing systems, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect – Image sensing and acquisition - Image sampling, Quantization- Relation between pixels. Color image fundamentals – RGB, CMY and HSI models, Tranforms-DFT, DCT, Walsh Hadamard, KLT, and SVD.

UNIT-II IMAGE ENHANCEMENT 9

Basic gray level transformation, Histogram Processing, equalization and specification techniques, Enhancement using Arithmetic / Logic Operations - Spatial filtering – Smoothing and sharpening filters. Frequency domain filtering - Smoothing and sharpening filters, Homomorphic filtering. Color image enhancement – Pseudo color image processing, Basics of full color image processing.

UNIT-III IMAGE RESTORATION 9

Model of image degradation and restoration process, Noise model, Restoration in presence of noise(Spatial filtering), Periodic Noise reduction by frequency domain filtering – Estimating the degradation function (Blind convolution) - Inverse filtering - Wiener filtering – Constrained least square filtering, Geometric mean filter, Geometric transformations.

UNIT-IV IMAGE SEGMENTATION, REPRESENTATION AND DESCRIPTION 9

Detection of Discontinuities - Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological.

Representation and Description – Representation - Boundary Descriptor and Regional Descriptor

UNIT-V IMAGE COMPRESSION 9

Need for data compression, Coding , Interpixel, Psychovisual Redundancy – Fidelity criteria –- Image compression model – Error free compression – variable length coding, Huffman coding, Arithmetic coding, Lzw coding, Bitplane coding, Loss Less predictive coding – lossy compression – Lossy predictive coding, Transform coding, Image Compression Standards – Continuous Tone Still Image Compression Standards(JPEG), Video Compression Standards (MPEG) .

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson,Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

REFERENCE(S)

1 S.Jayaraman, S.Esakkirajan, T.Veerakumar, "Digital Image Processing', TMH, 2009.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								1	2	2	3	2
CO2	2	2	2	2	2	1						1	2		3	2
CO3	2	2	2	2	2	1						1	2		3	2
CO4	3	2	2	2	2							1			3	2
CO5	3	2	2	2	2	1						1	2		3	2
CO6	2	2	2	2	1							1			3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7C	AGRICULTURE ELECTRONICS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Elective					
Prerequisites:	12EC41 - Electronic Circuits II and Microprocessor 12GE31 - Environmental Science and Engineering					
Aim:	To develop an electronics platform for agriculture to raise the standards so that agriculture can be long lasting and competitive.					
Course Objectives:	• To interpret the basic skills related to agricultural machines systems components and their operation, and the fundamentals of agricultural machines. • To identify the functions of transducers & agro meteorology. • To describe the impact of microprocessors in agricultural monitoring.					
Course Outcomes:	1. Summarize the concepts of soil science including its physical, chemical and biological processes. 2. Elaborate crop science and analyze differenttypes of crops. 3. Discover the function of transducers and its types. 4. Demonstrate the agro meteorology and automation techniques of agricultural equipment. 5. Utilize the application of computers and special information technology in agriculture field. 6. Apply the concepts of microprocessor and microcontroller in agriculture field.					

UNIT-I BASICS OF AGRICULTURE 9

Introduction to Soil Science- Soil structure, Soil properties, Soil processes Formation of Soil, types of soils, Organisms and soil processes, Soil as a medium for plant growth, Soil moisture & efficiency soil pH values and crop production Chemical analysis of soil, water bearing capacity, Soil erosion and conservation, measurement of soil parameters. Introduction to Crop Science- Elementary crop science, Basic principles and advances in photosynthesis. Pest and disease management, Post harvesting, Role of fertilizers, Different types of crops eg. Floriculture, Horticulture

UNIT-II AGRICULTURE TRANSDUCERS 9

Introduction -transducer function-characteristics of transducer-displacement and motion transducer –temperature transducer –pressure transducer -grain moisture transducer -soil moisture transducer –humidity transducer –pH transducer -Gas transducer-intelligent sensors.

UNIT-III INTRODUCTION TO AGRO METEOROLOGY 9

Wind speed and direction, Radiation, rain Agro meteorological instruments: Anemometer, Use of PLDs, Microprocessors and Microcontroller, Data converters, Display devices, in agricultural automation. Use of opto-electronic devices for measurement and control of physical parameters in agri- electronics, Agricultural equipment and automation, Automatic drip irrigation- Green House Instrumentation: Green House Technology introduction, instrumentation required for tissue culture techniques.

UNIT-IV COMPUTERS & SPECIAL INFORMATION TECHNOLOGY IN AGRICULTURE 9

SIT, GIS/ GPS software's Applications for Ground water modeling, crop forecasting & estimate, soil erosion etc, Use of Digital Image processing, Satellite missions, Hyper spectral remote sensing, physics of optical & microwave remote sensing, thermal mapping. Simulators used for study of crop growth. Data logger, features of data loggers, data loggers for dedicated use in agriculture, Computer based automatic weather station.

UNIT-V MICROPROCESSOR APPLICATIONS IN AGRICULTURE 9

Microprocessor based systems- Microprocessor based grain moisture measurements- Microprocessor based safe grain storage system monitoring- Microprocessor based soil nutrient

estimation systems-drip irrigation instruments-supervisory control and data acquisition systems-Introduction to precision agriculture.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Krishna kant "Microprocessor-Based Agri Instrumentation" 1st edition, PHI, 2004.

REFERENCE(S)

1. George Joseph, "Fundamentals of remote sensing", Second Edition, University Press, 2005.
2. V.N. Sahi, "Fundamentals of Soil" Kalyani Publication, 2004
3. T.P.Ojha and A.M. Michale, "Principles of Agricultural Engineering", Jain Brothers Publications, 2005.
4. I.V. Muralikrishna , "Spatial information technology " Volume I & II, B.S.Publications, 2001

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2		2					2		3		3
CO2	3	2	2	2	2	1	2					2		3		3
CO3	3	3	2	2	2	1	2					2		3		3
CO4	3	2	2	2	2	2	2					2		3		3
CO5	3	3	2	2	2	2	2					2		3		3
CO6	3	2	2	2	2	2	2					2		3		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7D	LOW POWER VLSI		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Elective					
Prerequisites:	12EC61 - VLSI Design					
Aim:	To analyze the advanced topics in VLSI circuit and system design.					
Course Objectives:	The objective of the course is to make the students to: • design low power CMOS circuits • analyze various power estimation techniques • examine about the synthesis tool and software design for reducing area and power					
Course Outcomes:	1. Analyze the need for low power VLSI and different sources of power dissipation in CMOS structure. 2. Illustrate the advanced techniques in low power design which is a hot topic in today's market where the power plays major role. 3. Examine various power estimation and analysis techniques. 4. Design low power CMOS circuits using various techniques. 5. Examine the architecture and system design of low power circuits. 6. Design software for simulating low power circuits.					

UNIT-I LOW POWER BASICS & TECHNOLOGY IMPACT 9

Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches. Physics of power dissipation in CMOS devices. Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

UNIT-II POWER ESTIMATION &SIMULATION POWER ANALYSIS 9

SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems

UNIT-III LOW POWER CMOS CIRCUIT TECHNIQUES 9

Computer Arithmetic techniques for low power systems - Reducing power consumption in memories - Low power clock, Interconnect and layout design - Advanced techniques - Special techniques.

UNIT-IV LOW POWER ARCHITECTURE & SYSTEMS, LOW POWER CLOCK DISTRIBUTION 9

Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design- Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip and package co-design of clock network.

UNIT-V SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER 9

Synthesis for Low power - Behavioral level transforms- Software design for low power.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. K.Roy and S.C. Prasad, "Low Power CMOS VLSI Circuit Design", Wiley,2000.
2. Dimitrios Soudris, Chirstian Pignet, Costas Goutis, "Designing CMOS Circuits for Low Power", Kluwer,2002.
3. Gary K. Yeap, Farid N. Najm, "Low power VLSI design and technology", World Scientific Publishing Ltd., 1996.

REFERENCE(S)

1. J.B. Kuo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999
2. Chandrakasan, R. Brodersen, "CMOS Low Power Digital Design", Kluwer Academic Publications. 1995.
3. Abdellatif Bellaouar, Mohamed.I. Elmasry, "Low power digital VLSI design", Kluwer, 1995.
4. James B. Kuo, Shin - chia Lin, "Low voltage SOI CMOS VLSI Devices and Circuits", John Wiley and sons, 2001.
5. Rabaey, M. Pedram, "Low Power Design Methodologies", Kluwer Academic Publications. 1996.
6. Christian Piguet, "Low-power CMOS circuits: technology, logic design and CAD tools", CRC Press,Taylor & Francis Group, 2006.
7. Dimitrios Soudris, Christian Piguet, Costas Goutis," Designing CMOS circuits for low poer",Kluwer Academic Publishers,2002.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1	1						2	3	3		2
CO2	3	3	3	2	2						2	2	3	3		2
CO3	3	3	3	3	3				3		2	2		3	3	3
CO4	3	3	3	3	3	2			3		2	2		3		3
CO5	3	3	3	2	2							2		3		3
CO6	3	3	3	3	3							2		3		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7E	RADAR AND NAVIGATIONAL ENGINEERING		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Elective					
Prerequisites:	12EC54 - Antennas and Wave Propagation					
Aim:	To analyze the modern radar and navigation systems.					
Course Objectives:	The objective of the course is to make the students to: • analyze the RADAR theory • compare the different types of RADAR and their working principle • discuss about the RADAR signal detection methods					
Course Outcomes:	1. Demonstrate the RADAR and RADAR Equations. 2. Analyze the losses and propagation effects of RADAR 3. Demonstrate the working principle of MTI and pulse Doppler RADAR. 4. Infer the concepts of RADAR signal detection techniques. 5. Classify the various navigation systems. 6. Analyze the functionalities of RADAR transmitter and receiver.					

UNIT-I RADAR EQUATIONS 9

RADAR Block Diagram & operation – RADAR Frequencies – RADAR Equation –Detection of signals in Noise – RADAR cross section of targets – RADAR cross section fluctuations – transmitter power – pulse repetition frequency – system, losses and propagation effects.

UNIT-II MTI AND PULSE DOPPLER RADAR 9

Introduction to Doppler & MTI RADAR – Delay Line canceller – Moving Target,Detector – Pulse Doppler RADAR – Non-Coherent MTI – CW RADAR – FMCW-RADAR – Tracking RADAR – Monopulse Tracking – Conical Scan and Sequential Lobing.

UNIT-III RADAR SIGNAL DETECTION AND PROPAGATION ON WAVES 9

Detection criteria – automatic detection – constant false alarm rate receiver – Ambiguity diagram – pulse compression – introduction to clutter – surface clutter – RADAR equation – anomalous propagation and diffraction.

UNIT-IV RADIO NAVIGATION 9

Adcock directional finder – automatic directional finder – Decca Navigation System Tactical Air Navigation – Instrument Landing System – Ground Controlled Approach

UNIT-V RADAR TRANSMITTER AND RECEIVER 9

Linear beam power tubes – Solid state RF power sources – solid state devices used in RADAR – Magnetron- crossed field amplifiers – other aspects of radar transmitter – RADAR Receiver – Receiver noise figure – super heterodyne receiver – dynamic range – RADAR Displays.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Skolnik.M.I, “Introduction to RADAR systems”, Mc-Graw Hill, 3rd Edition,1981.
2. Nagaraja.N.S. “Elements of Electronic Navigation”, Tata Mc-Graw Hill, 2nd Edition, 1993.

REFERENCE(S)

1. Nadav Levanon, “RADAR Principles”, John Wiley and Sons, 1989.
2. Brookner, “RADAR Technology”, Artech House, 1986.
3. Mark, Richards.A, “Fundamentals of radar signal processing”, Mc-Graw Hill, Electronic Engineering, 1st Edition, 2005.
4. Bagad.V.S, “Radar Systems”, Technical publications, 1st edition,2008.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								2	3	2		3
CO2	2	3	2	2	1							2	3	2	2	3
CO3	3	2	2	3	1							2	3	2	2	3
CO4	3	3	2	2	1	1						2	3	2	2	3
CO5	3	2	2	2	2	1						2	3	2	2	3
CO6	2	2	2	2	2	1						2	3	2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7F	MEDICAL ELECTRONICS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Elective					
Prerequisites:	12EC41 - Electronic circuits II and Microprocessor 12EC42 - Linear Integrated Circuits					
Aim:	To make students to understand the applications of electronics in diagnostic and therapeutic area.					
Course Objectives:	• Have a basic understanding of medical terminology, relevant for biomedical & study the methods of recording various biopotentials. • To study how to measure biochemical and various physiological information. • To understand the working of units which will help to restore normal functioning. • To study different bio telemetry and their uses. • To understand the use of radiation for diagnostic and therapy. • To understand the need and technique of electrical safety in Hospitals Instrumentation in modern hospital care.					
Course Outcomes:	1. Clasify bio potentials and their typical waveforms &characteristics. 2. Interpret measurements of biochemical &nonelectrical parameters. 3. Illustrate the working of Heart assist devices & BioTelemetry. 4. Illustrate the working of biotelemetry & tele medicine. 5. Analyze about radiation & their uses in the medical field. 6. Summarize the principles of electrical safety in hospitals instrumentation in modern hospital care.					

UNIT-I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; Biopotential electrodes, Biological amplifiers, ECG, EEG,EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT-II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

Colorimeter, photometer, Spectrophotometer, pH, pO2, pCO2,Complete Blood gas analyzers, Blood flow meter, cardiac output, Pulmonary function analyzers , Blood pressure, temperature, pulse, Blood cell counters.

UNIT-III ASSIST DEVICES AND BIO-TELEMETRY 9

Cardiac pacemakers, Cardiac Defibrillators, Wireless telemetry, single channel telemetry systems, Multichannel telemetry systems, Implantable Telemetry Systems, Telemedicine

UNIT-IV MODERN IMAGING SYSTEMS 9

X-ray Machines and Digital radiography, X ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System

UNIT-V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Laser applications in biomedical field, Physiotherapy and Electrotherapy equipment, Electrical safety in medical equipment.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2003.

REFERENCE(S)

1. Leislie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology",
3. John Wiley and Sons, New York, 2004.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2							2	2		2	2
CO2	3	3	3	2	2	2						2		2	2	2
CO3	3	3	3	2	2	2						2	1	2	3	2
CO4	3	3	3	2	2	1						2	3	2	2	2
CO5	3	3	3	2	2	2	2					2	2	2	3	2
CO6	3	3	3	2	2	2	2	1			2	2	3	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7G	AUTOMOTIVE ELECTRONICS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Elective					
Prerequisites:	12EC63 - Embedded Systems					
Aim:	To make the students apply the concept of electronics in real time embedded applications.					
Course Objectives:	To make the students to: • develop the skill of hardware and software to build the embedded systems • interpret the programming and debugging methods suitable for embedded systems					
Course Outcomes:	1. Analyze the need for automotive electronic system 2. Summarize the vehicle electronic systems including charging system, ignition system and others. 3. Classify the fundamentals of embedded systems from hardware and software perspectives. 4. Analyze the methods of programming and debugging of embedded systems. 5. Demonstrate the concepts of embedded systems for automotive applications. 6. Develop the protocols used in the embedded systems communication.					

UNIT-I ELECTRONICS IN AUTOMOTIVE SYSTEMS 9

Overview of Automotive Mechanical systems - Need for Automotive Electronics System - Performance (Speed, Power and Torque) - Control (Emission, Fuel Economy, Drivability and Safety) and Legislation (Environmental legislation for pollution and safety norms) - Overview of vehicle electronic systems - Basic electrical components and their operation in an automobile-Power train subsystem(Starting systems, Charging systems, Ignition systems, Electronic fuel control) - Chassis subsystem(ABS,TCS and ESP) - Comfort and safety subsystems (Night vision, airbags, Seatbelt Tensioners, Cruise Control-Lane-departure-warning, Parking)

UNIT-II EMBEDDED HARDWARE AND SOFTWARE 9

Hardware module - Introduction to an embedded board -components - Software Module: IDE Getting started: Creating new project, creating new files, adding files to project, compile, build, debug and simulation of a project.

UNIT-III EMBEDDED SYSTEM PROGRAMMING AND DEBUGGING 9

Embedded System Programming - Up-loaders- ISP - ROM Emulators - In-Circuit Emulators - Debug Interfaces: BDM and JTAG.

UNIT-IV EMBEDDED SYSTEM IN AUTOMOTIVE APPLICATIONS 9

Engine management systems - Gasoline/ Diesel systems, various sensors used in system - Electronic transmission control -Vehicle safety system - Electronic control of braking and traction - Body electronics - Infotainment systems - Navigation systems - System level tests - Software calibration using engine and vehicle dynamometers - Environmental tests for Electronic Control Unit - Application Control Unit - Application of Control elements and control methodology in Automotive System.

UNIT-V EMBEDDED SYSTEM COMMUNICATION PROTOCOLS 9

Introduction to control networking - Communication protocols in embedded systems - SPI, I^2C, USB - Vehicle communication protocols - Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Denton.T, "Automobile Electrical and Electronic Systems", Edward Arnold Publishers, 4th Edition 2012.
2. Nicholas Navit, "Automotive Embedded System Handbook", CRC press,2009 .

REFERENCE(S)

1. Robert Bosch GmbH, "Automotive Handbook", John Wiley & Sons, 6th Edition, 2004.
2. Knowles.D, "Automotive Electronic and Computer Controlled Ignition Systems", Prentice Hall,1998.
3. William B. Ribbens, "Understanding Automotive Electronics", Newnes Publishing, 6th Edition 2003.
4. Joerg Schaeuffele, Thomas Zurawka - "Automotive Software Engineering - Principles, Processes, Methods and Tools", SAE Publications,2005

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3		2	3					2		2		3
CO2	3	2	2	2	1	1	1					2		2		3
CO3	3	2	2	1	2							2		2		3
CO4	3	2	3	3	2							2		2		3
CO5	3	2	1	3	2	2	2					2		2		3
CO6	3	2	1	1	2	2						2		2		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7H	DOMESTIC AND ENTERTAINMENT ELECTRONICS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VII			
Category:	Elective					
Prerequisites:	12F2X5 - Electric Circuits and Electron Devices					
Aim:	To make the students apply the use of the electronic gadgets and entertainment electronics.					
Course Objectives:	To make the students to: • discuss the various loudspeakers and microphones • construct the working principle of tape recorders • demonstrate about the monochrome and colour television systems • discuss about the basic blocks of home appliances					
Course Outcomes:	1. Demonstrate the technical specification of Electronics audio system (microphone and speaker). 2. Analyze the principles of Tape recorders and noise reduction technologies. 3. Evaluate the components of Television System and explain the working. 4. Illustrate the colour TV systems 5. Estimate the functions of Cam coder and shooting a video and saving them in various formats. 6. Analyze the functionality of consumer electronics products like microwave oven, washing machine and Air Conditioning.					

UNIT-I LOUDSPEAKERS AND MICROPHONES 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT-II AUDIO TAPE RECORDERS 9

The magnetic bias principle, The erase principle, The noise reduction principle, Tape recorder analysis, other noise-reduction technologies

UNIT-III TELEVISION SYSTEMS 9

Components of a TV system – interlacing –composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes -Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT-IV OPTICAL RECORDING AND REPRODUCTION 9

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems, The CD player, CD-ROM, Digital Audio tape,

Video Cassette Recorders: Comparison to audio tape recording, Encoding, The conceptual VCR, Non idealities and their solutions, Remaining VCR Circuitry, a real VCR, special effects, enhancements.

UNIT-V HOME APPLIANCES 9

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. S.P.Bali, “Consumer Electronics”, Pearson Education, 2005.

REFERENCE(S)

1. Philip Hoff, "Consumer Electronics for Engineers", Cambridge University Press ISBN 9780521582070

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	1	2						2	2	3		3
CO2	3	2	2	2	1	2	1					2	2	3		3
CO3	3	2	2	2	1	2						2		3	3	3
CO4	3	2	2	2	2	2						2	1	3		3
CO5	3	2	2	2	1	2						2	2	3		3
CO6	3	2	1	2	1	2	1					2		3	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC7I	POWER ELECTRONICS		L	T	P	C
			3	0	0	3
Programme:	B.E Electronics and Communication Engineering	**Sem:**	VII			
Category:	Elective					
Prerequisites:	12F2X5 - Electric Circuits and Electron Devices 12EC35 - Electrical Engineering					
Aim:	To analyze the electronic devices for conversion, control and conditioning of electronic power**.**					
Course Objectives:	The objective of the course is to make the students to: • discuss about power electronic circuits for voltage and current control and protection • analyze the controlled rectification AC supplies • compare types and working of converters, inverters & special machines					
Course Outcomes:	1. Classify the various Power Electronics devices such as SCR, TRIAC, DIAC, IGBT, and GTO. 2. Analyze application circuits of power electronics devices in Choppers, Inverters and Converters. 3. Examine the Inductors and Capacitors in Choppers, Inverters and Converters. 4. Control the Electrical rectifier through DC-DC converters, AC Converters and DC Motor. 5. Design the switching behavior and power supply of electronic circuits. 6. Compare types and working of converters, inverters & special machines					

UNIT-I POWER SEMICONDUCTOR DEVICES 9

Power transistors - Fast recovery diodes- Thyristors- Power TRIAC- MOSFET- IGBT- GTO- characteristics- rating, Protection circuits, Driver Circuits

UNIT-II CONTROLLED RECTIFIERS AND AC VOLTAGE CONTROLLER 9

Single Phase and Three Phase Controlled rectifiers- Design of Trigger circuits - Dual Converters- AC Voltage controller

UNIT-III CONVERTERS & POWER SUPPLIES 9

DC - DC Converters - Gating requirements- Switching mode regulators - Boost, Buck, Buck-Boost and Cuk regulators, DC and AC Power supplies - Switched mode- Resonant and Bidirectional Power supplies.

UNIT-IV INVERTERS 9

Voltage and current source inverters- Resonant- Series inverter- PWM inverter.

UNIT-V SPECIAL MACHINES 9

DC motor drives-Induction and Synchronous motor drives - Switched reluctance and brushless motor drives - Solid state relays - Microelectronic relays

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Muhammad H.Rashid, "Power Electronics - Circuits, Devices and Applications", 3rd Edition, Prentice Hall of India, 2004.

REFERENCE(S)

1. M.D.Singh, K.B. Khanchandani, "Power Electronics", Tata McGraw-Hill, 1998.
2. Ned Mohan, Tore M.Undeland, William P.Robbins, "Power Electronics, Converters,

Applications and Design", John Wiley & Sons, 1994.
3. B.K.Bose, "Modern Power Electronics", Jaico Publishing House, 1999Sen, "Power Electronics", Tata McGraw-Hill, 1987

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2								1		3		2
CO2	3	3	2	2								1		3		2
CO3	3	2	2	2								1		3		2
CO4	3	2	2	2								1		3		2
CO5	3	2	2	2								1		3		2
CO6	3	2	2	1								1		3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12MG71	TOTAL QUALITY MANAGEMENT		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category :	Elective					
Prerequisites:	---					
Aim:	To introduce the concept, procedure, and process involved in management systems.					
Course Objectives:	The objective of the course is to make the students to: • understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management • understand the statistical approach for quality control • create an awareness about the ISO and QS certification process and its need for the industries					
Course Outcomes:	1. Summarize the concept of quality and total quality management. 2. Demonstrate the Philosophies of quality management. 3. Apply the concepts of six-sigma, benchmark and process capability. 4. Design and implement tools for Quality management. 5. Demonstrate the importance of customer and various problem solving skills by ISO standards. 6. Create an awareness about the ISO and QS certification process and its need for the industries					

UNIT-I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM -TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT-II PRINCIPLES OF TQM 9

Leadership - Strategic quality planning, Quality statements - Customer focus - Customer orientation, Customer satisfaction, complaints, and retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Appraisal of Performance

UNIT-III TQM TOOLS & TECHNIQUES 9

The seven traditional tools of quality - New management tools - Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT - Bench marking - process - FMEA - Stages, Types.

UNIT-IV TQM TOOLS & TECHNIQUES II 9

Quality circles - 5s, Kaizen, Quality Function Deployment (QFD) - Taguchi Quality loss function - TPM - Concepts**,** improvement needs - Cost of Quality - Performance measures.

UNIT-V QUALITY SYSTEMS 9

Need for ISO 9000 - ISO 9000-2000 Quality System - Elements, Documentation, Quality auditing- QS 9000 - ISO 14000 -Concepts, Requirements and Benefits - Case studies of TQM implementation in manufacturing and service sectors including IT

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, 3rd Edition, Indian Reprint 2009.
2. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,

2006.
3. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition,2003.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1							1	3		2	3	3				
CO2								2		1	3	3				
CO3			1		2		3		2	2	3	3				
CO4			2		1		2		1	1	3	3				
CO5					2	1	3	2	3	2	3	3				
CO6			2		1		2		1	1	3	3				

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8A	CABLE AND FIBER TECHNOLOGY		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC74 - Fiber Optic Communication					
Aim:	To familiarize the students with concepts related to the operation analysis and stabilization of control systems.					
Course Objectives:	The objective of the course is to make the students to: • analyze the types of cables • explain the electrical properties of the cable • discuss about optical fibre characteristics • compare the installation methods of optical fibre					
Course Outcomes:	1. Analyze the different types of cables and their electrical characteristics. 2. Compare characteristics of Near-End Crosstalk (NEXT), Power Sum NEXT (PSNEXT), Far-End Crosstalk (FEXT), ELFEXT, and PS ELFEXT. 3. Analyze the characteristics of UTP and STP cables. 4. Demonstrate the characteristics and design issues of optical fiber. 5. Classify the optical cable installation methods. 6. Design optical system and applications.					

UNIT-I TYPES OF CABLE AND ELECTRICAL CHARACTERISTICS 9

Types of Cables and Construction: Unshielded Twisted Pair (UTP) Cabling. Shielded Twisted Pair (STP), STP Versus UTP, Coaxial Cable, Optical Fiber Cable, Copper Versus Fiber Cable, comparison between power line cables and RF cables, Electrical model of a cable: balanced and unbalanced, Characteristics Impedenace, Impedance Matching. **Electrical Characteristics:** Attenuation, Capacitance, Delay distortions – Propagation Delay, Delay Skew, Noise, Near-End Crosstalk (NEXT), Power Sum NEXT (PSNEXT), Far-End Crosstalk (FEXT), ELFEXT, PS ELFEXT, Attenuation to Crosstalk Ratio (ACR)

UNIT-II TWISTED PAIR CABLES AND STRUCTURED CABLING SYSTEMS 9

UTP cable, AWG conductor size, UTP cable categories and their characteristics, comparison of UTP categories, 4-pair colour code, multiple pairs colour code, Screened Twisted-Pair (ScTP) cable, Shielded Twisted-Pair (STP) cable, UTP & STP Cable Connectors, Telco 50-pin connector. TIA/EIA-568-A & B standards

UNIT-III OPTICAL FIBERS CHARACTERISTICS 9

Single-mode and multimode optical fibres, Fibre design issues, Fibre manufacturing methods,Specification of the optical fibres characteristics, Fibre attributes, Cables attributes, Link attributes, Mechanical and environmental effects on the optical fibres, General structure of optical fibre cables

UNIT-IV OPTICAL CABLE INSTALLATION METHODS AND SAFETY 9

Cable installation methods- Installation of cables in underground ducts- Installation of optical cables with the trenchless technique- Installation of optical cables with the mini-trench technique- Installation of optical cables with the micro-trench technique- Installation of aerial cables- Installation of buried cables- Installation of cables in tunnels and on bridges- Installation of optical fibre ground wire (OPGW) cable-- Installation of optical cables along railways- Installation of cables in sewer ducts- Installation of marinized and submarine optical cables- Installation of indoor cables, Safety, in-service protection and location

UNIT-V OPTICAL SYSTEMS DESIGN AND APPLICATIONS 9

"Worst case" design for systems without line amplifiers, "Worst case" design for system with optical line amplifiers, intra-office systems,metro access (metro) systems, metro-core (regional) systems, long-haul (backbone) systems, repeaterless and repeatered submarine systems

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. John Crisp, "Introduction to Copper Cabling", Application for telecommunications, data Communications and networking", OXFORD.
2. "Optical fibre, cables and systems", ITU – T Manual.

REFERENCE(S)

1. John R. Vacca, "Cabling Handbook", 2 nd edition, Prentice Hall PTR, 2000
2. Chris Clark, "Network Cabling Handbook", Tata McGraw-Hill, 2002
3. BICSI Association, "Telecommunications Cabling Installation", McGraw Hill 0071409793
4. Clyde N.Herrick, Placerville, "Telecommunications Wiring", Prentice Hall, 3rd Edition 2000 0130286966
5. David Barnet, "Cabling the complete Guide to network wiring", SYBEX 0782143318
6. James Abruzzino, "Communications Cabling"

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2								2	2	2		2
CO2	2	3	2	2	1							2	3	2	2	2
CO3	3	2	2	2	1							2	2	2		2
CO4	3	2	2	2	1							2	2	2		2
CO5	2	2	2	2	1	2						2	2	2		2
CO6	2	2	3	3	2							2	2	2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8B	CYBER CRIME AND DIGITAL FORENSICS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category	Elective					
Prerequisites:	12EC64 - Computer Communication and Networks					
Aim:	To enable students to understand issues associated with the nature of cybercrime, digital evidence, detection methods and proof, in a variety of digital forensic contexts, including computers, networks and portable digital devices.					
Course Objectives:	Students will be able to: • gain knowledge on varieties of cybercrime • illustrate digital forensic examinations, where evidence is collected to support or oppose a hypothesis • interpret the need and nature of digital intelligence gathering • show the role of file system in detecting and mapping user activity • summarize the nature of live forensics and network-based detection techniques					
Course Outcomes:	1. Clarify the concepts of cybercrime. 2. Outline the various issues of cybercrime. 3. Illustrate Internet Hacking and Cracking, digital laws and legislation 4. Summarize the methods and tools of cyber crime investigation. 5. Develop the procedures of digital and network forensics. 6. Estimate various laws and regulation dealing with cyber crime and digital forensics.					

UNIT-I INTRODUCTION 9

Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

UNIT-II CYBER CRIME ISSUES 9

Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation ,Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

UNIT-III INVESTIGATION 9

Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT-IV DIGITAL FORENSICS 9

Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

UNIT-V LAWS AND ACTS 9

Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.
3. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
4. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004. "Understanding Forensics in IT", NIIT Ltd, 2005.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3				2	1		2			2	2	2			1
CO2	3				2	1	2	2			2	2	2			1
CO3	3	2		2	2	2		2			2	2	3		3	2
CO4	3	2		2	2	2		2			2	2	3		3	2
CO5	3				2	2		2			2	2	3		3	2
CO6	3				2	2		2			2	2	2			1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8C	SATELLITE COMMUNICATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC33 - Networks and Transmission Lines 12EC43 - Electromagnetic fields and Waveguides					
Aim:	To become familiar with satellites and satellite services.					
Course Objectives:	• To gain knowledge of satellite orbits and launching procedure. • To explain the earth segment and space segment components. • To analyze the satellite access by various users and compression standards. • To adopt with advanced Mobile satellite services.					
Course Outcomes:	1. Identify the fundamentals of orbital mechanics and the characteristics of common orbits used by communications and other satellites. 2. Classify launching methods and technologies, Overview of Spacecraft subsystem. 3. Evaluate accurate link budget for a satellite or other wireless communications link& Calculate the reliability of the satellite. 4. Estimate modern modulation and multiple access techniques in satellite systems. 5. Design the radio propagation channel for Earth station to satellite and satellite to satellite communications links. 6. Identify the analog and digital technologies used for satellite communications networks. 7. Summarize the mobile satellite services such as GSM and GPS, Know about various satellite application such as DTH , BTV and GRAMSAT.					

UNIT-I OVERVIEW OF SATELLITE SYSTEMS, ORBITS 9

Introduction – Frequency Allocations for Satellite Services – Intelsat – U.S.Domsats – Polar Orbiting Satellites – Kepler's First Law – Kepler's Second Law – Kepler's Third Law – Definitions of Terms for Earth-orbiting Satellites – Orbital Elements – Apogee and Perigee Heights – Orbital Perturbations – Effects of a Nonspherical Earth – Atmospheric Drag – Inclined Orbits The Sub-satellite Point .

UNIT-II GEOSTATIONARY ORBIT & SPACE SEGMENT 9

Introduction – Antenna Look Angels – The Polar Mount Antenna – Limits of Visibility – Near Geostationary Orbits – Earth Eclipse of Satellite – Sun Transit Outage – Launching Orbits – Problems – Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem.

UNIT-III EARTH SEGMENT & SPACE LINK 9

Introduction – Receive-Only Home TV Systems – Outdoor Unit – Indoor Unit for Analog (FM) TV – Master Antenna TV System – Community Antenna TV System – Transmit-Receive Earth Stations– Equivalent Isotropic Radiated Power – Transmission Losses – Free-Space Transmission – Feeder Losses – Antenna Misalignment Losses – Fixed Atmospheric and Ionospheric Losses – Link Power Budget Equation – System Noise – Antenna Noise – Amplifier Noise Temperature – Amplifiers in Cascade – Noise Factor – Noise Temperature of Absorptive Networks – Overall System Noise Temperature – Carrier-to-Noise Ratio – Uplink – Saturation Flux Density – Input Back Off – The Earth Station HPA – Downlink – Output Back off – Satellite TWTA Output – Effects of Rain – Uplink rain-fade margin – Downlink rain-fade margin – Combined Uplink and Downlink C/N Ratio – Intermodulation Noise.

UNIT-IV SATELLITE ACCESS 9

Single Access – Preassigned FDMA, Demand-Assigned FDMA, SPADE System.Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis.

TDMA : Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction,

Code-Division Multiple Access – Direct-Sequence spread spectrum – code signal c(t) – autocorrelation function for c(t) – Acquisition and trackling – Spectrum spreading and dispreading – CDMA throughput.

UNIT-V DIRECT BROADCAST SATELLITE SERVICES 9

Introduction – Orbital Spacings – Power Rating and Number of Transponders – Frequencies and Polarization – Transponder Capacity – Bit Rates for Digital Television – MPEG Compression Standards – Forward Error Correction – Home Receiver Outdoor Unit (ODU) – Home Receiver Indoor Unit (IDU) – Downlink Analysis – Uplink - Satellite Mobile Services – VSATs – Radarsat – Global Positioning Satellite System .

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.

REFERENCE(S)

1. Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons (Asia) Pvt. Ltd. 2004
2. Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson, Satellite Communication Systems Engineering, Pearson Education Ltd., Second edition 2003.
3. M.Richharia Satellite Communication Systems (Design Principles Macmillan Press Ltd. Second Edition 2003.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								1	3			
CO2	3	2	3	2								1	3			
CO3	3	3	2	2								1	3			
CO4	3	2	2	2								1	3		3	3
CO5	3	2	2	2	1							1	3		2	3
CO6	3	2	2	2	2	1						1	3		3	3
CO7	2	2	3	2	2	1						1	3	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8D	MULTIMEDIA COMMUNICATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC62 - Digital Communication 12EC64 - Computer communication and Networks					
Aim:	To introduce the fundamental concepts of multimedia technology.					
Course Objectives:	Students will be able to: • discuss about the multimedia components • use encoding and decoding techniques • apply various compression and decompression techniques in audio video ,text & image • analyze the protocols used for multimedia communication					
Course Outcomes:	1. Identify basic components of a multimedia project. 2. Summarize various audio and video compression standards. 3. Analyze different methods of text and image compression. 4. Elaborate the basics of IP transport and VoIP challenges. 5. Clarify the issues in providing QOS. 6. Illustrate the concept of multimedia networking and its services					

UNIT-I MULTIMEDIA COMPONENTS 9

Introduction -Multimedia skills - Multimedia components and their characteristics -Text, sound, images, graphics, animation, video, hardware.

UNIT-II AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, and 4

UNIT-III TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding –arithmetic coding –Lempel ziv-welsh Compression-image compression.

UNIT-IV VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods-VOIP applicability.

UNIT-V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP

TOTAL: 45 PERIODS

TEXT BOOK(S)

1.Fred Halsall "Multimedia communication - applications, networks, protocols and standards", Pearson education, 2007

2. Tay Vaughan, "Multideai: making it work", 7/e, TMH 2007

3. Kurose and W.Ross" Computer Networking "a Top down approach,Pearson education

REFERENCES:

1. Marcus gonzalves "Voice over IP Networks", Mcgaraw hill
2. KR. Rao,Z S Bojkovic, D A Milovanovic, "Multimedia Communication, Standards, and Networks", Pearson Education 2007
3.R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education
4. Ranjan Parekh, "Principles of Multimedia", TMH 2006.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								2	3		2	2
CO2	3	3	3	3	1				2			2	3	2	2	2
CO3	3	3	3	2	1							2	3	2	2	2
CO4	3	3	2	2	2				2			2	3		3	3
CO5	3	3	3	2	2				1			2	3		2	3
CO6	3	3	3	3	3	2			2			2	3	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8E	HIGH SPEED NETWORKS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC64 - Computer Communication and Networks					
Aim:	To familiarize the students with concepts related to the operation analysis and stabilization of control systems.					
Course Objectives:	The course objectives are to make the students to: • define the basics about ATM and Frame relay • explain about the techniques involved to support real-time traffic and congestion control • summarize the different levels of quality of service (QoS) to different applications					
Course Outcomes:	1. Examine the current state of the art in the field of networking technology. 2. Illustrate how fiber optics and ATM technologies influence the design and implementation of computer networks. 3. Model the single server queues and understand the issues involved in congestion control and the concept of RF amplifier design. 4. Observe the TCP flow control mechanism and traffic control techniques in ATM network. 5. Justify the need for various integrated and differentiated services. 6. Identify the approaches that support the provision of QoS in Internet.					

UNIT-I HIGH SPEED NETWORKS 9

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, TM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs:Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11.

UNIT-II CONGESTION AND TRAFFIC MANAGEMENT 8

Queuing Analysis - Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT-III TCP AND ATM CONGESTION CONTROL 11

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT-IV INTEGRATED AND DIFFERENTIATED SERVICES 8

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT-V PROTOCOLS FOR QOS SUPPORT 9

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. William Stallings, "High Speed Networks and Internet", Pearson Education, Second Edition, 2002.

REFERENCE(S)

1. Warland, PravinVaraiya, "High performance communication networks", Second Edition Jean Harcourt Asia Pvt. Ltd., , 2001.
2. IrvanPepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture",Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2	1						2	2			2
CO2	3	2	3	2	2	1			2			2	2			2
CO3	3	3	3	2	2	2					2	2	2			2
CO4	3	2	2	2	2	1			2			2	2			2
CO5	3	3	3	2	2				2			2	2			2
CO6	3	3	3	2	2	2			2			2	2			2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8F	INTRODUCTION TO MEMS SYSTEM DESIGN		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC61 - VLSI Design 12EC71 - Microwave and RF Systems					
Aim:	The aim of the course is to exposure the concepts of Micro Electromechanical systems and devices.					
Course Objectives:	• To provide an introduction to micro-electro-mechanical systems with special focus on optical applications. • To give them hands on experience for the fabrication processes using micro-fabrication tools in the clean room. • To demonstrate dynamics and modeling of Microsystems.					
Course Outcomes:	1. Clarify MEMS sensor working principles with their fabrication. 2. Summarize the mechanical characteristics and mechanical design. 3. Examine the electro static design of MEMS sensors. 4. Demonstrate the modeling of MEMS sensor and actuator. 5. Analyze the MEMS problems and software design. 6. Illustrate the Optical and RF MEMS with their applications.					

UNIT-I INTRODUCTION TO MEMS 9

MEMS and Microsystems, Miniaturization, Typical products, Micro sensors, Micro actuation, MEMS with micro actuators, Micro accelerometers and Micro fluidics, MEMS materials, Micro fabrication

UNIT-II MECHANICS FOR MEMS DESIGN 9

Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics.

UNIT-III ELECTRO STATIC DESIGN 9

Electrostatics: basic theory, electro static instability. Surface tension, gap and finger pull up, Electrostatic actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators. bistable actuators.

UNIT-IV CIRCUIT AND SYSTEM ISSUES 9

Electronic Interfaces, Feedback systems, Noise, Circuit and system issues, Case studies – Capacitive accelerometer, Peizo electric pressure sensor, Modeling of MEMS systems, CAD for MEMS.

UNIT-V INTRODUCTION TO OPTICAL AND RF MEMS 9

Optical MEMS, - System design basics – Gaussian optics, matrix operations, resolution. Case studies, MEMS scanners and retinal scanning display, Digital Micro mirror devices. RF Memes –design basics, case study – Capacitive RF MEMS switch, performance issues.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Stephen Santuria," Microsystems Design", Kluwer publishers, 2000.

REFERENCE(S)

1. Nadim Maluf," An introduction to Micro electro mechanical system design", Artech House, 2000
2. Mohamed Gad-el-Hak, editor," The MEMS Handbook", CRC press Baco Raton, 2000.
3. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproject (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 86-90% - 8, 81-85% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(80-89), B(70-79), C(60-69), D(55-59), E(50-54), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	1							2		3		3
CO2	3	3	3	2	1							2		2		3
CO3	3	3	3	2	2	3						2		2		2
CO4	3	3	2	3	2	2						2		2		3
CO5	3	2	2	3	1							2				3
CO6	3	3	3	2	2	2						2	2	2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8G	SIMULATION OF COMMUNICATION SYSTEMS AND NETWORKS		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC62 - Digital Communication 12EC73 - Wireless Communication					
Aim:	To promote the reuse and sharing of simulation models for communication networks and their components.					
Course Objectives:	To make the students to: • classify the communication systems, channel models & their performance • analyze the impact of random variables & random process in communication systems • simulate networks using NS-2					
Course Outcomes:	1. Classify different channel modeling and simulation methods. 2. Develop the role of important elements of random variables and random process. 3. Analyze and design Monte Carlo simulation algorithms to calculate the bit error rate of digital communication systems. 4. Illustrate the modelling and analyze the queuing systems with applications to communication systems. 5. Illustrate embedded Markov chain analysis of TDM systems 6. Design the networks using Network Simulator (NS2).					

UNIT-I MODELLING OF COMMUNICATION SYSTEM AND CHANNEL MODELS 9

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bustry channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system models.

UNIT-II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9

Univariate and multivariate models, Transformation of random variables, Bounds and approximation,Random process models-Markov AND ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers

UNIT-III BIT ERROR PERFORMANCE OF COMMUNICATION SYSTEMS 9

Quality of an estimator, estimator of SNR, Probability density functions of analog communication system,BER of digital communication systems, Montecarlo method and Importance sampling method, estimation of power spectral density of a process.

UNIT-IV MODELLING COMMUNICATION NETWORKS & QUEUES 9

Queuing models, M/M/I and M/M/I/N queues, Little formula, Burke's theorem, M/G/I queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems - Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flow chart - Routing model

UNIT-V SIMULATION OF NETWORKS 9

Network Layout and Reliability, Study of Network Simulator NS – 2

TOTAL: 45 PERIODS

REFERENCE(S)

1. M.C. Jeruchim, Philip Balaban and K. Sam Shanmugam, "Simulation of Communication Systems", Plenum Press, New York, 1992.
2. A.M.Law and W.David Kelton, "Simulation Modeling and analysis", McGraw Hill Inc., New York, 1991.
3. J.F. Hayes, "Modeling and Analysis of Computer Communication networks", Plenum Press, New York, 1984.
4. Jerry Banks and John S. Carson, "Discrete-event system Simulation", Prentice Hall, Inc., New Jersey, 1984

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								2	3		2	3
CO2	3	3	2	2	1							2	2		2	3
CO3	3	3	2	2	1							2	3	2	2	3
CO4	3	3	2	2	2	2						2	3		3	3
CO5	3	3	2	2	2	2						2	3	2	3	3
CO6	3	3	2	2	3	2						2	2	2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8H	ROBOTICS AND AUTOMATION		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC56 - Microcontrollers Architecture and Programming					
Aim:	This course deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing.					
Course Objectives:	• To provide the basic structure and design of robot. • To understand the functions and types of sensors & control systems. • To understand the usage of robots in factory automation.					
Course Outcomes:	1. Classify the robotic systems. 2. Analyze the selection of drive system for a particular application. 3. Illustrate the functions and types of sensors & control systems. 4. Design the various sensors and their applications in robots. 5. Examine the principles of robot kinematics, dynamics, motion planning, trajectory generation and control. 6. Develop an application for automation.					

UNIT-I CLASSIFICATION OF ROBOTIC SYSTEMS 9

Basic structure of a robot – Classification of robots: Cartesian, Cylindrical, Spherical, Articulated, SCARA. Accuracy, resolution and repeatability of robots. Robot application in manufacturing: Material transfers – Machine loading and unloading – Processing operations – Assembly and inspection.

UNIT-II DRIVES AND CONTROL SYSTEMS 9

Hydraulic and Pneumatic systems: cylinders, control valves, hydro motor. Types of mechanical power drive, rotary to linear motion conversion mechanisms. Robot end effectors. Servomotors – operation, stepper motors – control loops using current and voltage amplifier. Robot controllers – configuration of robot controller

UNIT-III SENSORS AND VISION SYSTEMS 9

Types of sensors, tactile sensors, proximity sensors and speed sensors – Encoder, resolvers – Tactile sensors – Touch sensors – Force and torque sensors - Vision systems: Image processing and analysis, Segmentation, Feature extraction, Object Recognition.

UNIT-IV TRANSFORMATIONS AND KINEMATICS 9

Homogeneous coordinates – Coordinate reference frames – Homogeneous transformations for the manipulator – The forward and inverse problem of manipulator kinematics – Motion generation – Manipulator dynamics – Jacobian in terms of D-H matrices – Controller architecture

UNIT-V FACTORY AUTOMATION 9

Flexible Manufacturing Systems concept – Automatic feeding lines, ASRS, transfer lines, automatic inspection – Computer Integrated Manufacture – CNC, intelligent automation, Industrial networking, bus standards

TOTAL: 45 PERIODS

TEXT BOOK(S)

1.Mikell P Groover, "Automation Production Systems and Computer Integrated Manufacturing", Prentice-Hall India, New Delhi

REFERENCE(S)

Bolton W, "Mechatronics", Pearson Education Asia, Third Edition, 2004.
2. Fu K S, Gonzalez R C and Lee C S G, "Robotics: Control, Sensing, Vision and Intelligence",

McGraw Hill, New Delhi, 1987.
3. Mikell P Groover, "Industrial Robotics – Technology, Programming and Applications", McGraw Hill, New Delhi, 1986.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1								2		2		3
CO2	3	3	2	2								2		2		3
CO3	3	3	2	1	2							2		2		3
CO4	3	2	2	2	2	1						2		2		3
CO5	3	2	2	2	2	1						2		2		3
CO6	3	3	2	3	2	1						2		2		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12EC8I	SPREAD SPECTRUM TECHNIQUES		L	T	P	C
			3	0	0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	VIII			
Category:	Elective					
Prerequisites:	12EC62 - Digital Communication 12EC73 - Wireless Communication					
Aim:	The course is intended to make the students apply the spread spectrum techniques in communication.					
Course Objectives:	To make the students to: • explain the basics and need for spread spectrum and its types • discuss about various modulation and demodulation techniques used in spread spectrum • analyze performance of communication systems					
Course Outcomes:	1. Analyze the different types of spread spectrum and hopping techniques. 2. Demonstrate the coding techniques. 3. Classify modulation and demodulation techniques of spread spectrum. 4. Analyze the performance of spreading code acquisition and tracking circuits. 5. Identify the commercial applications of spread spectrum techniques. 6. Test and evaluation of spread spectrum systems					

UNIT-I INTRODUCTION 9

Origin of Spread Spectrum – Spreading the Spectrum – Progress Gain – Jamming Margin – Direct Sequence System – Direct Sequence Signal Characteristics – Direct Sequence Code –Spectrum relationship – Frequency Hopping Signal Characteristics – Frequency Hopping Rate and No. of frequencies – Time Hopping – Chirp System – Hybrid Forms.

UNIT-II CODING 9

Maximal sequences – Linear Code Generator – Auto Correlation and Cross Correlation of codes-– Composite codes – Chip rate and code length – Choosing a linear code – Generating high rate-codes – Code selection and Signal spectra – Initial Synchronization – Tracking.

UNIT-III MODULATION – CORRELATION AND DEMODULATION 9

Modulation – Balanced Modulation – Frequency Synthesis – Sending the Information – Remapping the Spread Spectrum – Effect of non synchronous input signal – Base band recovery.

UNIT-IV SYNCHRONIZATION 9

Noise figure and Co-channel users - Dynamic range and AGC - Propagation Medium – Overall Receiver-Transmitter Design – Ranging Techniques – Direction finding – Special Antennas.

UNIT-V APPLICATIONS OF SPREAD SPECTRUM METHODS 9

Space Systems – Avionics Systems – Test Systems and Equipment – Message Protection – Position Location – Test and Evaluation of Spread Spectrum Systems – Sensitivity, Selectivity, Jamming Margin, Synchronous acquisition, loss of Synchronization – Signal to noise ratio Vs Interference level – Process gain – FCC Method – Cross Correlation – Transmitter Measurements.

TOTAL: 45 PERIODS

REFERENCE(S)

1. R.C.Dixom, Spread Spectrum Systems, John Wiley, 1984.
2. GR Cooper, CD Mc Gillen, Modern Communications and Spread Spectrum, Mc Graw Hill,1986.

3. M.K.Simon, J.K.Omura, R.A.Scholtz and B.K.Levitt, Spread Spectrum Communication, Vol.1,Vol.II, Vol.III, Computer Science Press, USA, 1984.
4. Roger L.Peterson, Rodger E.Zienia, David E.Borth, Introduction to Spread Spectrum Communications, Prentice Hall Inc., 1995.

Evaluation Criteria & Marks	Continuous Assessment (25)			End Semester Examination	Total Marks
	Assess.Tests (60%)	Assign/Seminar/ Miniproj (30%)	Attendance (10%)		
	15	7.5	2.5	75 [Min Pass: 37]	100 [Min Pass: 50]
Attendance Mark	91% and above – 10, 85-90% - 8, 81-84% - 6, 76-80% - 4, 75% - 2				
Grade Criteria	S(90-100), A(81-89), B(71-80), C(61-70), D(56-60), E(50-55), U (<50)-Fail				

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1			1						3		2	
CO2	3	3	2	1									3		2	
CO3	3	3	2	1									3			
CO4	3	3	2	1									3	2	2	2
CO5	3	3	2	1			1						3	2	2	2
CO6	3	3	2	1			1					2	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)