P.S.R. ENGINEERING COLLEGE

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

Sevalpatti (P.O), Sivakasi – 626140.

B.E. Electronics and Communication Engineering

CURRICULUM
AND
SYLLABI

U.G
Regulation 2016

Department of
Electronics and Communication Engineering

CANDIDATES ADMITTED DURING 2016-2017 AND ONWARDS

INSTITUTE VISION AND MISSION

VISION

To contribute to the society through excellence in technical education with societal values and thus a valuable resource for industry and the humanity.

MISSION

- To create an ambience for quality learning experience by providing sustained care and facilities.
- To offer higher level training encompassing both theory and practices with human and social values.
- To provide knowledge based services and professional skills to adapt tomorrow's technology and embedded global changes.

DEPARTMENT VISION AND MISSION

VISION

- The vision of the Electronics and Communication Engineering Department is to produce graduates with sound knowledge for the betterment of society and to meet the dynamic demands of industry and research.

MISSION

- Offering under graduate and post graduate programmes by providing effective and balanced curriculum and equip themselves to gear up to the ethical challenges awaiting them
- Providing the technical, research and intellectual resources that will enable the students to have a successful career in the field of electronics and communication engineering.
- Providing need based training and professional skills to satisfy the needs of society and industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- Lead a professional career by acquiring the basic knowledge in the field of specialization and allied Engineering.
- Assess the real life problems and deal with them confidently relevance to the society.
- Engage in lifelong learning by pursuing higher studies and participating in professional organizations.
- Exhibit interpersonal skills and able to work as a team for success.

PROGRAM SPECIFIC OUTCOMES (PSOs)

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

PROGRAMME OUTCOMES (POs)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design / Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:**Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend

and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

P.S.R.ENGINEERING COLLEGE

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

Sevalpatti (P.O), Sivakasi - 626140.

Tamilnadu State

REGULATIONS FOR UG [B.E/B.TECH] PROGRAMME

UNDER CHOICE BASED CREDIT SYSTEM

[For the Students Admitted from the Academic Year 2016 - 2017 and Onwards]

CONTENTS

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) "**Programme**" means Under Graduate Degree Programme (B.E./B.TECH)

ii) **"Branch**" means specialization or discipline of B.E./B.TECH Degree Programme like "Mechanical Engineering", "Computer Science and Engineering", etc.

iii) "**Course**" means Theory or Practical subject that is normally studied in a semester, like Digital Electronics, Engineering Graphics, etc.

iv) "**Head of the Institution**" means the Principal of a College / Institution who is responsible for all academic activities of the College / Institution and for implementation of relevant Rules and Regulations.

v) **"Head of the Department"** means Head of the Department concerned.

vi) "**Controller of Examinations"** means the Authority of the College who is responsible for all activities of the Examinations.

vii) "**University**" means ANNA UNIVERSITY.

viii) **"College"** or **"Institution"** means P.S.R. Engineering College.

2. ELIGIBILITY FOR ADMISSION

Students for admission to the first year of the four year B.E / B.Tech Degree programme 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) An examination of any university or authority, accepted by the Anna University as equivalent thereto

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

Students for admission to the second year (Third Semester) of the four year B.E /

B.Tech Degree programme shall be required to have passed.

Diploma in Engineering / Technology conducted by the Directorate of Technical Education and any other conditions by the Government of Tamilnadu

3. PROGRAMMES OFFERED

A student may be offered admission to any one of the programme of study approved by the AICTE and University. The medium of instruction is English. The following programmes are offered in this college:

1. B.E-Electronics and Communication Engineering
2. B.E-Computer Science and Engineering
3. B.E-Electrical and Electronics Engineering
4. B.E-Mechanical Engineering

5. B.E-Civil Engineering
6. B.TECH-Bio-Technology

4. STRUCTURE OF THE PROGRAMMES

4.1 Categorization of Courses

B.E. / B. Tech. Programme will have a curriculum with syllabi consisting of theory and practical courses that shall be categorized as follows:

i) **Humanities and Social Sciences (HS)** courses include English, Professional Ethics, Communication skills, Environmental Science and Engineering, Management courses.

ii) **Basic Sciences (BS)** courses include Mathematics, Physics, Chemistry, etc.

iii) **Engineering Sciences (ES)** courses include Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, etc.

iv) **Programme Core (PC)** courses include the core courses relevant to the chosen specialization/branch, Project Work.

v) **Open Core (OC)** courses include the core courses relevant to the chosen specialization / branch which a student of other programmes can choose as an elective.

vi) **Programme Elective (PE)** courses include the elective courses relevant to the chosen specialization/ branch.

vii) **Open Elective (OE)** courses include the courses relevant to the chosen specialization / branch which a student can choose from the curriculum of other B.E. / B. Tech. programmes.

viii) **Skill Enhancement Courses (SK)** include Internship, Seminar, Industrial/Practical Training, courses on soft skills and technical skills.

4.2 Personality and Character Development

The students shall enroll in any one of the personality and character development programmes

- 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.

- Department Association - will have activities to improve students' technical skill and personality development.
- Sports / Games, etc.

4.3 **Industrial Training / Internship**

The students may undergo Industrial Training / Internship during summer / winter vacation at Research Organization and Industries with due approvals of the HOD and Principal.

4.4 **Industrial Visit**

Every student is required to undergo one industrial visit, starting from the second year of the programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

5. DURATION OF THE PROGRAMMES

5.1 A student is normally expected to complete the B.E. / B.Tech. Programme in 4 years (8 Semesters) but in any case not more than 8 years (16 Semesters). In the case of Lateral entry students, it is not more than 7 years (14 semesters) from the date of admission to the course, even if the candidate discontinues and rejoins subsequently.

5.2 Each semester shall normally consist of 90 teaching days (including examination days). The Head of the Department shall ensure that every faculty member imparts instruction as per the number of periods specified in the syllabus covering the full content of the syllabus for the course being taught.

5.3 The total duration for completion of the programme reckoned from the commencement of the first semester to which the student was admitted shall not exceed the maximum duration specified in clause 5.1 irrespective of the period of break of study (vide clause 18) or prevention (vide clause 7.3) in order that the student may be eligible for the award of the degree (vide clause 13).

6. COURSE ENROLLMENT AND REGISTRATION

6.1 The students on admission have to register and study the courses prescribed in the curriculum in the student's first Semester of study.

6.2 Each student shall be assigned to a Faculty Advisor who shall advice and counsel the student about the details of the academic programme and the choice of courses considering the students' academic background and career objectives from second semester onwards.

6.3 Every student shall enroll for the course of the succeeding semester before the last working day of the current semester as notified by the Principal. However, the student shall confirm the enrollment by registering for the courses within the first three working days after the commencement of the concerned semester.

6.4 If the student wishes, the student may drop or add courses (from III to VIII semesters only) within threeworking days after the commencement of the concerned semester and complete the registration process duly authorized by the Faculty Advisor. Total number of credits of such courses cannot exceed 6. However the maximum number of credits the student can register in a particular semester cannot exceed 30 credits (including courses for which the student has done reappearance registration).

6.5 No course shall be offered by a Department unless a minimum of 10 students register for that course.

6.6 The student shall register for the project work in the semester as specified in the curriculum.

6.7 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

6.8 The student shall register for theory courses in which the student has failed in the subsequent semesters when they are offered next (Reappearance Registration). The attendance requirement (vide clause 7) is not compulsory for such courses.

6.9 A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of letter grades / marks.

7. ATTENDANCE REQUIREMENTS FOR APPEARING SEMESTER EXAMINATION

A student who has fulfilled by the following conditions shall be deemed to have satisfied the requirements for appearing end semester examination of a particular course.

7.1 A student will be permitted to appear for the end semester examination of a course, only if he/she secures not less than 75% of attendance taking into account the number of periods required for that course as specified in the curriculum.

7.2 If a student secures attendance between 65% and less than 75% in any course in the current semester of his / her studies due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International level Sports events with prior permission from the Head of the Department concerned and Principal. The student shall be given exemption from the prescribed attendance requirement and the student shall be permitted to appear for the end semester examination of that course. In all such cases, the students should submit the required documents on joining after the absence.

7.3 Students who do not satisfy clause 7.1 and 7.2 and who secure less than 65%attendance in a course will not be permitted to write the End-Semester Examination of that course. The student has to register and repeat this course in a subsequent semester when it is offered next.

7.4 In the case of reappearance registration for a course, the attendance requirement as mentioned in Clauses 7.1 - 7.3 is not applicable. However, the student has to register for examination in that course by paying the prescribed fee.

8. ASSESSMENT PROCEDURE FOR AWARDING MARKS

All B.E. / B.Tech. Programmes consist of Theory Courses, Practical Courses and Skill Enhancement Courses. Appearance in End Semester Examination is mandatory for all courses including Theory, Practical and Project work. Performance in each course of study shall be evaluated based on (i) Internal Assessments throughout the semester and (ii) End Semester Examination at the end of the semester. Each course shall be evaluated for a maximum of 100 marks as shown below:

Category	Internal Assessment	End Semester Examination
Theory Courses	30	70
Practical Courses	30	70
Project Work	30	70
Skill Enhancement Courses	100	Nil

8.1 Internal Assessment For Theory Courses

The criteria for determining the internal assessment marks are:

i) **Internal Tests [60% weightage]**

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.

ii) **Assignment or Mini project [20% weightage]**

A student has to carry out either an assignment or mini project.

- 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 be submitted to the course tutor for evaluation.
- A mini project shall be in hardware or software. 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.

iii) **Seminar [10% weightage]**

The student has to make seminar on the topics related to the course. 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.

iv) **Attendance [10% weightage]**

(refer clause 8.5)

8.2 **Internal Assessment For Practical Courses**

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:	60% weightage
Practical Test:	30% weightage
Attendance (refer clause 8.5):	10% weightage

8.3 **Internal Assessment For Project Works**

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 criteria for arriving the internal assessment marks for the project work evaluated for 30 marks are:

Work assessed by the Project Guide:	50% weight
Assessment by a internal review committee:	50% weight

8.4 **Internal Assessment For Skill Enhancement Courses**

The courses under Skill Enhancement are evaluated by Continuous Assessments only. The Course Committee (vide clause 16) shall devise a common evaluation procedure.

In all the above cases, marks awarded for 100 marks shall be reduced to 30 Marks.

8.5 **Awarding Marks for Attendance**

% of Attendance	Below 75	75	76-80	81-85	86-90	Above 90
Marks	0	2	4	6	8	10

The student on doing reappearance registration has to appear for the assessments along with the current batch of students and earn internal assessment marks again.

9. PASSING REQUIREMENTS

- 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 mark secured for 100 in end-semester examination is converted to 70, minimum 35 marks must be secured for pass.
- If any programme, during any semester, conducts the laboratory in two parts, say Part 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.

10 AWARD OF LETTER GRADES

10.1 The performance of a student will be reported using letter grades, each carrying certain points as detailed below:

Marks Scored	Letter Grade	Grade Points	Description
90 - 100	O	10	Outstanding
80 - 89	A +	9	Excellent
70 - 79	A	8	Very Good
60 - 69	B +	7	Good
55 - 59	B	6	above Average
50 - 54	C	5	Average
0 - 49	RA	0	Reappearance
Incomplete	SA / AB	0	Shortage of Attendance / Absent

'RA' denotes Reappearance registration is required for that particular course.

'SA' denotes shortage of attendance (as per Clause 7) and hence prevented from writing end semester examination.

10.2 For the Co-curricular activities such as National Service Scheme (NSS) / YRC / RRC /Sports, a satisfactory / not satisfactory grading will appear in the mark sheet. Every student shall put in a minimum of 75% attendance in the training and attend the camp compulsorily. The training and camp shall be completed during the first year of the programme. However, for valid reasons, the Head of the Institution may permit a student to complete this requirement in the second year. A satisfactory grade in the above co-curricular activities is compulsory for the award of degree.

11 GPA AND CGPA CALCULATION

11.1 After results are declared, Grade Sheets will be issued to each student which will contain the following details:

- the list of courses registered during the semester and the grades scored.
- the Grade Point Average (GPA) for the semester and
- the Cumulative Grade Point Average (CGPA) of all courses registered from first semester onwards.

During each semester, the list of courses registered and the grades scored in each course are used to compute the Grade Point Average (GPA). GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

$$GPA = \frac{\sum_{i=1}^{n} C_i GP_i}{\sum^{n} C_i}$$

Where,

Ci - is the Credits assigned to the course

GPi - is the grade point corresponding to the letter grade obtained for each course

n - is number of all Courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA.

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. "RA" and "SA" grades will be excluded for calculating GPA and CGPA.

11.2 If a student studies more number of electives (PE/OE) than required as per the student's programme curriculum, the courses with higher grades alone will be considered for calculation of CGPA.

12 EXAMINATION PROCEDURE

End Semester examination shall be conducted by the office of the Controller of Examination of the College as per the prescribed rules and regulation on examinations of the college.

12.1 **Issue of Mark Sheet**

Individual mark sheet for each semester will be issued to the students, 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.

12.2 **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.

12.3 **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 prescribed norms of the College. Revaluation is not permitted for practical course and for project work.

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

12.4 **Challenging Valuation**

In case the student is not satisfied with the outcome of the revaluation the student can apply for 'Challenge Valuation'. The highest marks obtained by the student in all of the above will be considered for grading.

12.5 **Supplementary Examination**

1. The candidates who have failed in the regular End Semester Theory Examination are eligible to appear Supplementary Examination.
2. The candidates who are absent in the regular End semester theory examination may be allowed to appear in Supplementary Examination based on the valid reasons and the recommendation of the committee constituted by the Principal.
3. There is no Supplementary Examination for arrears.
4. There is no Supplementary Examination for practical courses.
5. Eighth semester (outgoing) candidates only will be permitted to appear special supplementary examination both in regular and arrear examination.
6. The maximum allowable courses for Supplementary Examination are 6 Courses per Candidate.
7. Supplementary Examination shall be conducted during week end holidays after declaration of revaluation results of the regular End Semester Examination.
8. Head of the Department shall forward the applications of the candidates of their department for appearing Supplementary Examination after due verification.

13 ELIGIBILITY FOR THE AWARD OF DEGREE

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

i) Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

ii) Successfully completed the course requirements and has passed all the prescribed examinations in all the 8 semesters within a maximum period of 8 years from the commencement of first semester to which the student was admitted.

iii) In the case of lateral entry, the student successfully completed the course requirements and has passed all the prescribed examinations in all the 6 semesters within a maximum period of 7 years from the commencement of third semester to which the student was admitted.

iv) Approval by the University for the award of degree.

14 CLASSIFICATION OF DEGREE

14.1 **First Class With Distinction**

A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

- Should have passed the examination in all the courses of all the eight semesters in First Appearance within **five** years, which includes authorized break of study of one year. Withdrawal from examination (vide Clause 17) will not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50
- Should NOT have been prevented from writing end semester examination due to lack of attendance in any of the courses.

14.2 **First Class**

A student who satisfies the following conditions shall be declared to have passed the examination in **First class**:

- Should have passed the examination in all the courses of all eight semesters **within five years**, which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of not less than 6**.50**

14.3 **Second Class**

All other students (not covered in clauses 14.1 and 14.2) who qualify for the award of the degree **(**vide Clause 12) shall be declared to have passed the examination in **Second Class**.

14.4 A student 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 (except approved withdrawal from end semester examinations as per clause 17) for the purpose of classification.

15 FACULTY ADVISOR

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 students will attach a certain number of students to a faculty of the Department who shall function as Faculty Advisor for those

students throughout their period of study. The Faculty Advisor shall advise the students in registering and reappearance registering of courses, authorize the process, monitor their attendance and progress and counsel them periodically. If necessary, the Faculty Advisor may also discuss with or inform the parents about the progress / performance of the students concerned.

The responsibilities for the faculty advisor shall be:

- To inform the students about the various facilities and activities available to enhance the students' curricular and co-curricular activities.
- To guide student enrollment and registration of the courses.
- To authorize the final registration of the courses at the beginning of each semester.
- To monitor the academic and general performance of the students including attendance and to counsel them accordingly.

16 COURSE COMMITTEES

16.1 Common Course Committee

A theory course handled by more than one faculty member shall have a "Common Course Committee" comprising of all faculties teaching that course and some students who have registered for that course. There shall be two student representatives from each batch of that course. One of the faculty members shall be nominated as Course Coordinator by the Head of the Department duly approved by the Principal.

The first meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. Two or three subsequent meetings in a semester may be held at suitable intervals**.** During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to the whole batch.

In addition the faculty members of a Common Course shall meet to ensure uniform evaluation of continuous assessments and prepare a common question paper for the continuous assessment tests after arriving at a common scheme of evaluation for the assessments (vide clause 8). The question paper for the end semester examination is common.

16.2 Multiple Courses Committee

If course(s) handled by a single faculty member, there will be "Multiple Courses Committee". This committee comprises of all the above faculty members and two student representatives from each course. One of the above faculty members, nominated by the Head of the Department shall coordinate the activities of this committee.

The functions of this committee is similar to that of the common course committee, which is as follows:

The first meeting of the Multiple Courses Committee shall be held within fifteen days from the date of commencement of the semester. Two or three subsequent meetings in a semester may be held at suitable intervals**.** During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all the students.

16.3 Overall Monitoring Committee

In addition, there shall be a overall monitoring committee for each semester of a programme which comprises of (i) the Course Coordinators / Course Faculty (as applicable), and (ii) Head of the Department. This overall monitoring committee shall meet periodically to discuss academic related matters, progress and status of the students of the semester concerned.

The overall monitoring committee can invite the Faculty Advisors or students for any of the committee meetings if necessary.

17 PROVISION FOR WITHDRAWAL FROM EXAMINATION

17.1 A student may, for valid reasons, (medically unfit / unexpected family situations / National / International sports) be granted permission to withdraw from appearing for the end semester examination in any course or courses in **ANY ONE** of the semester examinations during the entire duration of the degree programme. Theapplicationshall be sent to Principal, through HOD with required documents.

17.2 Withdrawal application shall be valid only if the student is otherwise eligible to write the examination (Clause 7) and if it is made a week before the commencement of the end semester examination in that course or courses and also recommended by the Head of the Department.

17.3 Withdrawal shall not be considered as an appearance for deciding the eligibility of a student for First Class with Distinction.

17.4 Withdrawal is permitted for the end semester examinations in the final semester only if the period of study the student concerned does not exceed 5 years as per clause 14.

18 TEMPORARY BREAK OF STUDY FROM A PROGRAMME

(i) A student is not normally permitted to temporarily break the study. However if a student 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 student 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 14 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 13).

(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.

19 RANK OF STUDENT

A student 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.

20 PROCUDURE FOR USING SCRIBER

If a student 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.

21 DISCIPLINE

Every student is required to observe disciplined 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. If an act of indiscipline reported, the principal shall constitute a disciplinary committee consisting of three senior faculty members / HODs of which one should be from the faculty of the student, to inquire into acts of indiscipline. The disciplinary action is subject to review by the Principal in case the student represents to the Principal. Any expulsion of the student from the college shall be with prior concurrence from directorate of technical education / university.

22 RESPONSIBILITIES OF A COURSE TUTOR

- Every course tutor member is required to maintain an 'Attendance and Assessment Record' for every semester which consists of attendance marked in each Theory / Practical / Skill Enhancement, the assessment marks and the record of class work (topics covered), separately for each course handled by the them. This should be submitted to the Head of the Department periodically (at least three times in a semester) for checking the syllabus coverage and the records of assessment marks and attendance. The Head of the Department will affix his/her signature and date after due verification.
- At the end of the semester, the record should be verified by the Head of the Department who shall keep this document in safe custody (for eight years).
- The records of attendance and assessment of both current and previous semesters should be available for inspection.
- The assessments on Course Outcomes (CO), Programme Outcomes (PO) and Programme Educational Objectives also should be carried out and submitted to Programme Coordinator / HOD.

23 REVISION OF REGULATION AND CURRICULUM

The College may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Academic Council of the College.

24 ANY OTHER RULES AND PROCEDURE

Any other rules and procedure which are not covered under the above clauses shall be discussed and framed by the Standing Committee of the college. Implementation of the Standing Committee resolutions is based on the approval / ratification by the Academic Council / Board of Management.

****

P.S.R.ENGINEERING COLLEGE, SIVAKASI-626140
UG REGUALTION-2016
B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING
CURRICULUM AND SYLLABI [I To VIII SEMESTER]

SEMESTER – I					
S.No	Code	Course Title	Category	L-T-P	C
1	161HS11	Essential English	HS	3-0-0	3
2	161MA11	Engineering Mathematics – I	BS	3-2-0	4
3	161PH11	Engineering Physics	BS	3-0-0	3
4	161CY11	Engineering Chemistry	BS	3-0-0	3
5	161CS11	Computer Programming	ES	3-0-0	3
6	161ME11	Engineering Graphics	ES	1-0-4	3
7	161PC17	Physics and Chemistry Laboratory-I	BS	0-0-4	2
8	161CS17	Computer Practices Laboratory	ES	0-0-4	2
9	161EE17	Engineering Practices Laboratory	ES	0-0-4	2
				No. of Credits: 25	

SEMESTER – II					
S.NO	**Code**	**Course Title**	**Category**	**L-T-P**	**C**
1	161HS21	Technical English	HS	3-0-0	3
2	161MA21	Engineering Mathematics – II	BS	3-2-0	4
3	161PH21	Physics of Materials	BS	3-0-0	3
4	161CY21	Environmental Science	BS	3-0-0	3
5	161EC21	Electronic Devices	PC	3-0-0	3
6	161EE21	Electric Circuit Theory	PC	3-0-0	3
7	161PC27	Physics and Chemistry Laboratory-II	BS	0-0-4	2
8	161EC27	UNIX Laboratory	ES	0-0-4	2
9	161EC28	Circuits and Devices Laboratory	PC	0-0-4	2
				No. of Credits: 25	

SEMESTER – III					
S.NO	Code	Course Title	Category	L-T-P	C
1.	161MA31	Transforms and Partial Differential Equations	BS	3-2-0	4
2.	161EC31	Analog Electronic Circuits	PC	3-0-0	3
3.	161EC32	Digital Electronics	PC	3-0-0	3
4.	161EC33	Electromagnetic Fields	PC	3-0-0	3
5.	161EC34	Electronic Measurements and Instrumentation	PC	3-0-0	3
6.	161EC35	Data Structures and C++	ES	3-0-0	3
7.	161EC37	Analog Electronic Circuits Laboratory	PC	0-0-4	2
8.	161EC38	Data Structures and C++ Laboratory	ES	0-0-4	2
9.	161HS39	Functional English I	MC	0-0-2	0
				No. of Credits: 23	

SEMESTER – IV					
S.NO	Code	Course Title	Category	L-T-P	C
1.	161MA41	Probability and Random Processes	BS	3-0-0	3
2.	161EC41	Analog Communication	PC	3-0-0	3
3.	161EC42	Linear Integrated Circuits	PC	3-0-0	3
4.	161EC43	Signals and Systems	PC	3-2-0	4
5.	161EC44	Transmission Lines and Waveguides	PC	3-0-0	3
6.	161EC45	Electrical Engineering	ES	3-0-2	4
7.	161EC47	Integrated Circuits Laboratory	PC	0-0-4	2
8.	161EC48	Engineering Software Laboratory	PC	0-0-4	2
9.	161HS49	Functional English - II	MC	0-0-2	0
No. of Credits: 24					

SEMESTER V					
S.NO	Code	Course Title	Category	L-T-P	C
1.	161EC51	Control Systems	PC	3-0-0	3
2.	161EC52	Digital Communication	PC	3-0-0	3
3.	161EC53	VLSI Design	PC	3-0-0	3
4.	161EC54	Antennas and Wave Propagation	PC	3-0-0	3
5.	161EC55	Digital Signal Processing	PC	3-2-0	4
6.	161EC56	Microprocessors and Microcontrollers	PC	3-0-0	3
7.	161EC57	Communication Systems Laboratory	PC	0-0-4	2
8.	161EC58	VLSI Laboratory	PC	0-0-4	2
9.	161HS59	Career English I	MC	0-0-2	0
No. of Credits: 23					

SEMESTER VI					
S.NO	Code	Course Title	Category	L-T-P	C
1.	161EC61	Embedded Systems	PC	3-0-0	3
2.	161EC62	DSP Architecture and Applications	PC	3-0-0	3
3.	161EC63	Microwave Engineering	PC	3-0-0	3
4.	161HS61	Engineering Economics and Management	HS	3-0-0	3
5.	-	Elective I*	PE	3-0-0	3
6.	-	Elective II*	OE / PE	3-0-0	3
7.	161EC67	Embedded Systems Laboratory	PC	0-0-4	2
8.	161EC68	DSP and Processor Laboratory	PC	0-0-4	2
9.	161EC69	Mini Project	EEC	0-0-2	1
10.	161HS69	Career English II	MC	0-0-2	0
No. of Credits: 23					

SEMESTER VII					
S.NO	Code	Course Title	Category	L-T-P	C
1.	161EC71	Wireless Communication	PC	3-0-0	3
2.	161EC72	Fiber Optic Communication	PC	3-0-0	3
3.	161EC73	RF Circuits	PC	3-0-0	3
4.	161EC74	Computer Networks	PC	3-0-0	3
5.	-	Elective III*	PE	3-0-0	3
6.	-	Elective IV*	OE / PE	3-0-0	3
7.	161EC77	Microwave and Optical Laboratory	PC	0-0-4	2
8.	161EC78	Computer Networks Laboratory	PC	0-0-4	2
				No. of Credits: 22	

SEMESTER – VIII					
S.NO	Code	Course Title	Category	L-T-P	C
1.	-	Elective V*	PE	3-0-0	3
2.	-	Elective VI*	PE	3-0-0	3
3.	161EC89	Project Work	EEC	0-0-12	6
				No. of Credits:12	

Total Number of Credits: 177

PROGRAMME ELECTIVES					
S.NO	Code	Course Title	Category	L-T-P	C
1.	161ECE01	Satellite Communication	PE	3-0-0	3
2.	161ECE03	Cognitive Radio	PE	3-0-0	3
3.	161ECE05	RFID and its Applications	PE	3-0-0	3
4.	161ECE06	Smart RADAR systems	PE	3-0-0	3
5.	161ECE07	Speech Processing	PE	3-0-0	3
6.	161ECE11	Energy Aware Computing	PE	3-0-0	3
7.	161ECE12	Industrial Internet of Things Design	PE	3-0-0	3
8.	161ECE13	Electronic Product Design	PE	3-0-0	3
9.	161ECE15	Low Power VLSI	PE	3-0-0	3
10.	161ECE18	Wearable Electronics	PE	3-0-0	3
11.	161ECE19	MEMS and NEMS	PE	3-0-0	3
12.	161ECE20	Agriculture Electronics	PE	3-0-0	3
13.	161ECE22	Smart Structures and Smart Materials	PE	3-0-0	3
14.	161ECE23	Cyber Security	PE	3-0-0	3
15.	161ECE24	Cryptography and Network security	PE	3-0-0	3
16.	161ECE26	Computer Architecture and Organization	PE	3-0-0	3
17.	161ECE27	Cloud Computing	PE	3-0-0	3
18.	161ECE29	Multicore Programming	PE	3-0-0	3
19.	161ECE30	Quantum Computing	PE	3-0-0	3

OPEN ELECTIVES					
S.NO	Code	Course Title	Category	L-T-P	C
1	161OE201	Bio Medical Instrumentation	OE	3-0-0	3
2	161OE202	Digital Image Processing	OE	3-0-0	3
3	161OE203	Consumer Electronics	OE	3-0-0	3
4	161OE204	Multimedia Compression and Communication	OE	3-0-0	3
5	161OE205	High Speed Networks	OE	3-0-0	3

HS – Humanities and Science, BS – Basic Sciences, ES- Engineering Sciences, PC – Programme Core,PE – Programme Elective, OE - Open Elective,MC – Mandatory Courses, EEC – Employability Enhancement Courses.

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS

S.NO	Code	Course Title	Category	L-T-P	C
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING					
1	161OE101	Web development using PHP	OE	3-0-0	3
2	161OE102	Programming in PERL	OE	3-0-0	3
3	161OE103	Multimedia & Animation Tools	OE	3-0-0	3
4	161OE104	Multicore Architecture	OE	3-0-3	3
5	161OE105	Green Computing	OE	3-0-3	3
6	161OE106	Soft Computing	OE	3-0-3	3
7	161OE107	Java Scripts	OE	3-0-3	3
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING					
1	161OE401	Energy audit and conservation	OE	3-0-0	3
2	161OE402	Principles of Virtual Instrumentation	OE	3-0-0	3
3	161OE403	Sensors and Transducers	OE	3-0-0	3
4	161OE404	Aircraft electronic system	OE	3-0-0	3
5	161OE405	Electrical safety	OE	3-0-0	3
6	161OE406	Vehicle electric power Systems	OE	3-0-0	3
7	161OE407	Domestic and Industrial Electrical Installation	OE	3-0-0	3
DEPARTMENT OF BIO TECHNOLOGY					
1	161OE501	Process Equipment and Plant Design	OE	3-0-0	3
2	161OE502	Biomaterials	OE	3-0-0	3
3	161OE503	Biosensors	OE	3-0-0	3
4	161OE504	Food Science and Technology	OE	3-0-0	3
DEPARTMENT OF MECHANICAL ENGINEERING					
1	161OE601	Maintenance Engineering	OE	3-0-0	3
2	161OE602	Non Destructive Testing and Materials	OE	3-0-0	3
3	161OE603	Operations Research	OE	3-0-0	3
4	161OE604	Renewable Sources of Energy	OE	3-0-0	3
5	161OE605	Robotics	OE	3-0-0	3
DEPARTMENT OF CIVIL ENGINEERING					
1.	161OE701	Disaster Management System	OE	3-0-0	3
2.	161OE702	Fundamentals of Fire Safety Engineering	OE	3-0-0	3
3.	161OE703	Optimization in Engineering	OE	3-0-0	3

4.	161OE704	Renewable Energy Sources	OE	3-0-0	3
5.	161OE705	Environmental Impact and Risk Assessment	OE	3-0-0	3
6.	161OE706	Environment and Ecology	OE	3-0-0	3
7.	161OE707	Technology Management	OE	3-0-0	3
8.	161OE708	Sustainable Management of Urban Ecology	OE	3-0-0	3
DEPARTMENT OF MANAGEMENT STUDIES					
1	161OE801	Essentials of Management	OE	3-0-0	3
2	161OE802	Fundamentals of Marketing	OE	3-0-0	3
3	161OE803	Managing Human Resources	OE	3-0-0	3
4	161OE804	Professional Ethics in Engineering	OE	3-0-0	3

CURRICULUM STRUCTURE

S.No	Course Categories	Total Number of Credits PSREC ECE (177)		Total Number of Credits AICTE (160)	
		Credit Distribution	% of weightage of Credits(%)	Credit Distribution	% of weightage of Credits(%)
1.	HSMC - Humanities and Science including management	9	5.08	12	7.5
2.	BSC - Basic Sciences	31	17.51	25	15.63
3.	ESC - Engineering Sciences	21	11.86	24	15
4.	PC – Programme Core	91	51.41	48	30
5.	PE - Programme Elective	12	6.78	18	11.25
6.	OE - Open Elective (OE)	6	3.39	18	11.25
7.	PROJ - Project	7	3.95	15	9.38
8.	Mandatory Courses (MC)	Non Credit Courses			

161HS11	ESSENTIAL ENGLISH	L-T-P	C
		3-0-0	3

Programme: B.E./B.Tech. Common to all branches **Sem:** 1 **Category:** HS

Aim: To impart Basic English Language skill to develop the students ability to use English effectively

Course Outcomes: The students will be able to

CO1. Illustrate the use of different forms of language (UN)
CO2. Construct formal letters. (AP)
CO3. Speak in English with clarity.(AP)
CO4. Listen actively and grasp the contents of the speech.(UN)
CO5. Read general texts and comprehend its content.(UN)
CO6. Use grammar to make meaning in both speaking and writing.(AP)

UNIT I **9**

Grammar –tense – past simple, present simple, verbal vs non-verbal communication, Vocabulary – Commonly used words – Spelling, Reading – Reading News papers, Writing – Formal Letters – Requisition for leave – Bonafide, Listening – Listening to famous speeches, Speaking – introducing oneself

UNIT II **9**

Grammar – tense – past and present simple continuous, Vocabulary – Prefixes, Suffixes –Parts of Speech, Reading – Basic reading comprehension, Writing Formal Letters – Permission letters – In-plant training – Industrial visit, Listening – Listening to Interviews, Speaking – Speaking about interests, one's friends, hobbies, favourite programmes

UNIT III **9**

Grammar – tense – past and present perfect, Vocabulary – Forms of Verb – Analogy – Sentences – Types, Reading-Cloze Test, Writing – Paragraph writing – descriptions – Comparing and contrasting – describing pictures, Listening – Listening to News, Speaking – Future plan – Native place, Appropriate body language.

UNIT IV **9**

Grammar – perfect tenses, Vocabulary – Single – line definitions – Pronoun – Adverbs – Preposition, Reading – Reading for comprehension, Writing – e- mail – basic conventions writing – Instructions –Recommendations, Listening – Listening to Debates, Speaking – Giving opinions

UNIT V **9**

Grammar – subject – verb agreement, Vocabulary – commonly confused words – Linkers – Abbreviation –Voice, Reading – Reading for Inferences, Writing – Agenda Note-taking – Editing the text, Listening – Listening to Telephonic Conversation, Speaking – short talks on general topics, short conversations

TOTAL PERIODS 45

TEXT BOOK

1. Jack.C.Richards, interchange, Cambridge University Press, New Delhi. (2015) ISBN 9781107570894

REFERENCES

1. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai. (2011)
2. www.usingenglish.com
3. www.grammar.org
4. www.audioenglish.com
5. http://www.manythings.org
6. www.onestopenglish.com
7. www.learnenglish.com

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				
CO2										3		3				
CO3									2	3		3				
CO4										3		3				
CO5										3		3				
CO6								2	2	3		2				

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

161MA11 ENGINEERING MATHEMATICS - I L-T-P C
3-2-0 4

Programme: B.E./B.Tech. Common to all branches **Sem: 1 Category: BS**

Aim: The Course is aimed at Developing the basic mathematical skills of Engineering Student.

Course Outcomes: The students will be able to

CO1: Explain the inverse of given matrix and reduce matrix equation using Cayley- Hamilton Theorem. (UN)
CO2: Illustrate differential; equations for different parameters.(UN)
CO3: Develop a series solution to an ODE, and recognize special functions defined by series.(AP)
CO4: Apply Calculus in finding the envelope, Evolutes & Involutes.(AP)
CO5: Interpret the convergent or divergent series. (UN)
CO6: Explain maxima and minima for function of two variables.(UN)

MATRICES **12**

Characteristic equation - Eigen Values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem (without proof) and its application - Orthogonal Transformation of a Symmetric matrix to diagonal form - Quadratic form - Orthogonal reduction to canonical form.

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

DIFFERENTIAL CALCULUS **12**

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

FUNCTIONS OF SEVERAL VARIABLES **12**

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

SEQUENCES AND SERIES **12**

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test and D'Alembert's ratio test – Alternating series – Leibnitz's test - Series of positive and negative terms – Absolute and conditional convergence.

TOTAL PERIODS 60

TEXT BOOKS

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

REFERENCES

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 Company, Chennai, 2004.
3. Veerarajan.T "**Engineering Mathematics(for first year)**",Fourth Edition,Tata Mcgraw – Hillpubl company Ltd,New Delhhi,2005.
4. Kandasamy.P, Thilagavathy.K, Gunavathy.K,S.Chand & Company Ltd. Ram Nagar,New Delhi.

5. Ravish R Singh, Mukul Bhatt, "Engineering Mathematics-I", McGraw Hill Publication (India) Pvt New Delhi.

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	3
CO2	3	3		2								2	2	2	2	2
CO3	2	2		2								2	2	1	2	2
CO4	2	2		2								2	2	2	2	3
CO5	3	3		1								2	2	2	2	2
CO6	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)

161PH11	**ENGINEERING PHYSICS**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E./B.Tech. Common to all branches **Sem: 1 Category: BS**

AIM: To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.

Course Outcomes: The students will be able to

CO1:Illustrate the theory and various crystal structures and crystal growth techniques. (UN)

CO2:Apply knowledge about the properties of sound, production of ultrasonic waves and their application in the field of Non-destructive testing and Sonogram. (AP)

CO3:Gain knowledge about basic equations of Quantum mechanics and its applications. (UN)

CO4: Know about the basic configuration of a Laser, types of lasers and the industrial applications of Laser.(UN)

CO5:Illustrate the principle behind fiber optic communication and the electronic devices involved in the transmission and reception of data.(UN)

CO6:Explain different the function of different LASERs in Fiber Optic Communication.(UN)

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 growth techniques- Solution, melt (Bridgemann and Czochralski).

ACOUSTICS **9**

Classification of sound – Decibel-Weber- Fechner Law- Sabine's formula-Derivation using growth and decay method- absorption coefficient and its determination- Acoustic of building-Factors affecting acoustics of buildings and their remedies.

ULTRASONICS **9**

Production of Ultrasonics – Magnetostriction – Piezoelectric methods – Velocity measurement – Acoustic grating – Industrial applications –Non Destructive Testing – Pulse echo system through transmission and reflection modes - SONAR, Medical applications – Sonograms.

QUANTUM PHYSICS **9**

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

APPLIED OPTICS **9**

LASERS: Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coeffcients – Derivation- Types of lasers – CO_2, Nd-YAG – Industrial Applications – Lasers in welding, cutting – Holography and its applications.

FIBER OPTICS:Optical Fiber-Classification- Principle and propagation of light in optical fibres-Numerical aperture and Acceptance angle-Fibre optical communication system- Sensors (Active and passive) –Displacement and Temperature Sensors.

TOTAL PERIODS 45

TEXT BOOKS

1. Gaur R. K., Gupta S. C., "Engineering Physics" DhanpatRai Publications, New Delh,2003
2. Avadhanulu M. N., Kshirsagar, P. G., "A Text book of Engineering Physics", S.Chand and company, Ltd., New Delhi, 2005.

REFERENCES

1. Serway and Jewett., "Physics for Scientists and Engineers with Modern Physics",6th Edition, Thomson Brooks/Cole, Indian reprint 2007
2. AritherBeiser, Concepts of Modern Physics, Tata McGraw Hill, NewDelhi 2010
3. Palanisamy, P.K., "Engineering Physics" Scitech publications, Chennai, 2007.
4. Rajendran, V and Marikani A, "Engineering Physics" Tata McGraw Hill Publications Ltd, III Edition, New Delhi, 2004.
5. Chitra Shadrach and SivakumarVadivelu, "Engineering Physics", Pearson Education, New Delhi, 2007.

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	2	2
CO2	3	2	2	2	2	2	1					2	2	2	2	2
CO3	3	2		2	2							2	2	2	2	2
CO4	3	3	3	3	2	2	2					2	3	3	3	3
CO5	3	3	3	2	2		3					3	3	3	3	3
CO6	3	2	2	2	2	2	1					3	3	3	3	3

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

161CY11	ENGINEERING CHEMISTRY	L-T-P	C
		3-0-0	3

Programme: B.E./B.Tech. Common to all branches **Sem: 1 Category: BS**

AIM: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Outcomes: The students will be able to

CO1: Demonstrate the essential concept of water and their properties and applications. (UN)
CO2: Explain the treatment of water for potable and industrial purposes. (UN)
CO3: Illustrate the operating principles and the reaction involved in electrochemistry. (UN)
CO4: Apply the core concepts of surface chemistry. (AP)
CO5: Illustrate the structure, properties and applications of nano materials.(UN)
CO6: Summarize the principles, importance and application of analytical techniques. (UN)

WATER TECHNOLOGY **9**

Hardness-Types and Estimation by EDTA method, alkalinity – types of alkalinity and determination–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.

ELECTROCHEMISTRY **9**

Electrochemical cells – reversible and irreversible cells – EMF — electrochemical series and its significance-Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH– potentiometer titrations (redox - Fe^{2+}vs dichromate) and conductometric titrations (acid-base – HCI vsNaOH) titrations

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.

NANOCHEMISTRY **9**

Nanomaterials – introduction to nanochemistry – synthesis – hydrothermal, solvothermal – Chemical vapour deposition – sol-gel - Electro deposition – ball milling – properties of nanoparticles and applications. Carbon nanotubes- fabrication - arc method – pulsed laser deposition - Chemical vapour deposition - structure, properties & applications.

SPECTROSCOPY & QUANTITATIVE ANALYSIS **9**

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – Determination of the amount of calcium in milk powder by EDTA Complexometry - Estimation of iodine in iodized common salt by Iodometry - Estimation of phosphoric acid in soft drinks (coca cola) by molybdenum blue method .

TOTAL PERIODS 45

TEXT BOOKS

1. P. Kannan, A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.

2. P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi, 2002

REFERENCES

1. S.S. Dara, S.S. Umare, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.
2. B.K.Sharma, "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut,2001.
3. B.Sivasankar, "Engineering chemistry" Tata McGraw Hill Publishing Company (P) Ltd., New Delhi, 2006.
4. Pradeep, "Nano the essential" McGraw Hill Publishing Company (P) Ltd., New Delhi,

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	2		2	3		2	2		3	1	1		
CO2	3	2	2	2	2	3	3		2	2	2	2	1	1		1
CO3	2	2	2	1	2	2	2		2			2	1	2	1	2
CO4	3	2	2	2		1	2					2	1	2	1	2
CO5	3	2	2	1	2	1	1		2			2	1	2	2	2
CO6	3	2	1	1	2	2						2		1		

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

161CS11 COMPUTER PROGRAMMING L-T-P C
3-0-0 3

Programme: B.E./B.Tech. Common to all branches **Sem: 1 Category: ES**
AIM: To provide an awareness to Computing and Programming
Course Outcomes: The students will be able to
CO1: Develop fundamental knowledge on basics of computers hardware and number systems. (AP)
CO2: Illustrate the basic terminology used in computer programming. (UN)
CO3: Construct, compile and debug programs in C language. (UN)
CO4: Classify different data types in a computer program. (UN)
CO5: Develop programs involving decision structures, loops and functions. (AP)
CO6: Understand the dynamics of memory by the use of pointers.(UN)

INTRODUCTION 9
Generation and Classification of Computers- Basic Organization of a Computer – Number System – Binary – Decimal – Conversion – Problems. Software – Types, Development Steps. Algorithm – Pseudo code – Flow Chart. Problem formulation – Problem Solving.

C PROGRAMMING BASICS 9
Introduction to Unix Operating System – Introduction to ' C' programming –fundamentals – structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

ARRAYS AND STRINGS 9
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

FUNCTIONS AND POINTERS 9
Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

STRUCTURES AND UNIONS 9
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Union – Programs using structures and Unions – File Manipulation – Storage classes – Pre-processor directives.

TOTAL PERIODS 45

TEXT BOOKS
1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. PradipDey, ManasGhosh, "Fundamentals of Computing and Programming in C", 1/e, Oxford University Press, 2009

REFERENCES

1. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
4. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 13/e, 2011.

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		3
CO2		2	1												2	3
CO3	3	3	2						2	1	1		2		2	3
CO4	2	2	2												2	3
CO5	2	2	3						2	1	1		2		2	3
CO6	2	2	2												2	3

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

161ME11	**ENGINEERING GRAPHICS**	**L-T-P**	**C**
		1- 0- 4	**3**

Programme: B.E./B.Tech. Common to all branches **Sem:** **1** **Category** ES
Aim: To develop graphics skills in students
Course Outcomes: The students will be able to
CO1: Follow the conventions used in engineering graphics.(UN)
CO2: Practice plane curves and free hand sketching. (AP)
CO3: Show the projections of points, lines and plane. (UN)
CO4: Sketch the projections of simple solids and their sectional views. (AP)
CO5: Discuss the applications of development of surfaces. (UN)
CO6: Practice isometric and perspective projections.(AP)

CONCEPTS AND CONVENTIONS (Not for Examination) **9**
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

PLANE CURVES **9**
Curves used in engineering practices:
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

PROJECTION OF POINTS, LINES AND PLANE SURFACES **9**
Projection of straight lines located in the first quadrant – inclined to both planes – Determination of true lengths and true inclinations– Projection of regular polygonal and circular lamina inclined to both reference planes.

9

PROJECTION OF SOLIDS
Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to one reference plane.

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **9**
Sectioning of above solids in simple vertical position by cutting planes inclined to HP and perpendicular to VP – Obtaining true shape of section, Development of lateral surfaces of truncated solids – Prisms, Pyramids, Cylinder and Cone.

ISOMETRIC AND PERSPECTIVE PROJECTIONS **9**
Principles of isometric projection – isometric scale – isometric projections of truncated Prisms, Pyramids, Cylinder and Cone.Perspective projection of simple prism and pyramid by Visual ray method

TOTAL PERIODS 45

TEXT BOOKS
1. K.V. Natrajan, “A text book of Engineering Graphics”,Dhanalakshmi Publishers, Chennai, 2015
2. M.S. Kumar, “Engineering Graphics”, D.D. Publications, 2014

REFERENCES

1. K. Venugopal and V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 2015
2. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education, 2014
3. K.C. John, "Engineering Graphics for degree" PHI Learning Pvt. Ltd., New Delhi, 2013
4. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2013
5. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2014

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

Special points applicable to end semester examination on Engineering Graphics:

1. There will be five questions, first question is compulsory from Unit-I on engineering curves. Other four questions are either or type from Unit-II to V
2. All questions will carry equal marks of 20 each making a total of 100
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size
4. The end semester examination will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time

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				1				2		1	
CO2	3	2	2	1	2				1				2	2	2	2
CO3	3	2	2		2				1				1		2	
CO4	3	2	3		2				1				1		2	2
CO5	3	2	3	1	2				1				1		2	1
CO6	2	2	2		2								1		2	

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

161PC17 PHYSICS AND CHEMISTRY LABORATORY-I

L	T	P	C
0	0	4	2

Programme: B.E./B.Tech. Common to all Branches **Sem:** 1 **Category:** BS

Aim: To introduce the basic Physics concepts through experiments and to impart the basic analysis in chemistry.

Course Outcomes: The students will be able to

CO1: Illustrate the concept of the laser light propagation in optical fibre. (UN)
CO2: Explain the principle of interference. (UN)
CO3: Demonstrate the velocity of sound, dispersive power and thermal conductivity of materials. (UN)
CO4: Have the knowledge of their home town water. (UN)
CO5: Explain the amount of substance by potentiometric technique. (UN)
CO6: Outline the application of analytical instrument.(UN)

LIST OF EXPERIMENTS – PHYSICS PART

(A minimum of five experiments shall be offered)

S. No.	NAME OF THE EXPERIMENT
1.	(a) Determination of Particle Size using Diode LASER. (b) Determination of wavelength of the LASER source. (c) Determination of Acceptance angle and Numerical aperture of an optical fibre.
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 a prism using Spectrometer.
5.	Determination of Young's modulus of the material – Non uniform bending.
6.	Determination of thermal conductivity of a bad conductor – Lee's Disc method

LIST OF EXPERIMENTS – CHEMISTRY PART

S. No.	NAME OF THE EXPERIMENT
1.	Estimation of Total Hardness of their home town Water by EDTA method.
2.	Estimation of Copper in brass by EDTA method.
3.	Estimation of Ferrous Ion by Potentiometric Titrations.
4.	Conductometric Titration of strong acid Vs strong base
5.	Estimation of Alkalinity of Water sample
6.	Estimation of iron by spectrophotometer (Demo only)

TOTAL PERIODS 45

REFERENCES

1. Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS, London.
2. A.Ravikrishnan "Practical Engineering Chemistry", Sri Krishna Publications, Chennai 2002.
3. Engineering Physics Laboratory Manual.
4. Engineering Chemistry Laboratory Manual.

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	2		2		3	1			2		2	2
CO2	3	2	2	2	2		3		3	1			2		2	1
CO3	2	2	3	2	2		2		3	1			2	1	2	2
CO4	2	2	2	3	2		2		3	1				2		
CO5	3	2	2	2	2		2		3	1				2		
CO6	3	2	2	2	2		2		3	1				2		2

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

161CS17 **COMPUTER PRACTICES LABORATORY** **L-T-P C**
0-0-4 2

Programme: B.E./B.Tech. Common to all branches **Sem: 1** **Category :** **ES**

AIM: To provide an awareness to Computing and C Programming

Course Outcomes: The students will be able to

CO1: Explain the fundamental concepts and basics commands in Linux. (UN)
CO2: Construct, compile and debug programs in C language. (UN)
CO3: Illustrate the problems and implement algorithms in C. (UN)
CO4: Effectively choose programming components that efficiently solve computing problems in real-world. (UN)
CO5: Develop the application oriented programs in C. (AP)
CO6: Structures and unions through which derived data types can be formed. (UN)

LIST OF EXPERIMENTS

1. eSearch, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. C Programming using Simple statements and expressions
4. Scientific problem solving using decision making and looping.
5. Simple programming for one dimensional and two dimensional arrays.
6. Solving problems using String functions
7. Programs with user defined functions – Includes Parameter Passing
8. Program using Recursive Function and conversion from given program to flow chart.
9. Program using structures and unions.
10. Program using files

TOTAL PERIODS 45

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			2			2	3
CO2	3	2	2	3	3				3			2	2		2	3
CO3	3	2	3	3	3				3			2	2		2	3
CO4	2	3	2	3	3				3			2	2		2	3
CO5	3	2	2	3	3				3			2	2		2	3
CO6	2	2	2	3	3				3			2			2	3

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

161EE17 ENGINEERING PRACTICES LABORATORY L-T-P C
0-0-4 2

Programme: B.E./B.Tech. Common to all branches **Sem: 1 Category: ES**

AIM: To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

Course Outcomes:

The Students will be able to

CO1. Explain the pipe connections And identify the various components used in plumbing.(UN)
CO2. Produce simple wooden joints using wood working tools. (UN)
CO3. Develop simple lap, butt and tee joints using arc welding equipments. (AP)
CO4. Develop the simple components using lathe and drilling machine. (AP)
CO5. Identify the fitting usage of square joint, L joint and stepped joints. (AP)
CO6. Facilitate the operation of fluorescent lamp, staircase wiring and measuring the consumed electrical energy. (UN)

LIST OF EXPERIMENTS

GROUP A (CIVIL and MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Plumbing Works:

a. Study of pipeline joints, its location and functions: valves, taps, couplings,unions,
b. reducers, elbows in household fittings.
c. Preparation of plumbing line sketches for water supply and sewage works
d. Hands-on-exercise
e. Basic pipe connections – Mixed pipe material connection – Pipe
f. Connections with different joining components

Carpentry using Power Tools only:

a. Study of the joints in roofs, doors, windows and furniture
b. Hands-on-exercise: Dismantling & Assembling of various wooden furniture like stool, Chairs & Bench

II MECHANICAL ENGINEERING PRACTICE

Welding:

a. Preparation of arc welding of butt joints and lap joints
b. Study of Gas welding equipments & practice

Fitting:

a. Hands-on-exercise: Preparation of square fitting, vee& step – fitting models

III GROUP B (ELECTRICAL and ELECTRONICS)

Electrical:

a. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
b. Fluorescent lamp wiring.
c. Stair case wiring
d. Measurement of electrical quantities – voltage, current, power and power factor in RLC circuit.
e. Measurement of energy using single phase energy meter.

Electronics:

a. Study of Electronic components and equipments – Resistor, colour coding.
b. Measurement of AC signal parameter (peak-peak, rms period,frequency)using CRO.

TOTAL PERIODS:45

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
CO2	2	2	1	1	3				3		1					2
CO3	2	2	1	1	3				3		1			2		2
CO4	2	2	3	3	2				3					2		2
CO5	2	2			2				3				2	2		2
CO6	2	2	2		1				3		1		2	3	1	2

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

161HS21	**TECHNICAL ENGLISH**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E/B.Tech (Common to all Branches) **Sem: 2 Category: HS**

Aim: To improve confident of the learner to communicate effectively using technical related workplace modules

Course Outcomes: The students will be able to

CO1. Remember words and its meaning for the specific purpose. (UN)
CO2. Improve written communication methodologies at workplace. (UN)
CO3. Develop listening skill to respond and to gather information. (AP)
CO4. Interpret the text using comprehending skill. (UN)
CO5. Discuss the topic using appropriate vocabulary. (AP)
CO6. Summarize the key points in the audio script. (UN)

UNIT I **9**

Language and Grammar – Technical words – Foreign words – Adjective, **Reading** – Reading Technical passages, **Writing** – Formal Letters – Calling for Quotation, placing order, **Listening** – Listening to TED Talks to take notes, **Speaking** – Introducing others

UNIT II **9**

Language and Grammar – Interrogative Statements – Acronym – One-word substitution, **Reading** – Note-taking, **Writing** – Essay writing – Preparing Questionnaire, **Listening** – Listening to Group Discussion, **Speaking** – Public Speech practice

UNIT III **9**

Language and Grammar – Conditional Clauses – Punctuation – Concord, **Reading** – Reading Book/film/music reviews, **Writing** – Report writing, **Listening** – Listening to Technical Presentation, **Speaking** – Reporting events

UNIT IV **9**

Language and Grammar – Words followed by prepositions – Articles – Action verb, **Reading** – Reading Famous speech text, **Writing** – Minutes – Checklist – Memo, **Listening** – Listening for Gist, **Speaking** – discussing about uses of gadgets & machines

UNIT V **9**

Language and Grammar Vocabulary, cause and effect, reported speech Reading – Reading for vocabulary, **Writing** – dialogue writing, **Listening** – Listening for Gist, **Speaking** – discussing about uses of gadgets & machines

TOTAL PERIODS: 45

TEXT BOOK

1. Department of English, Anna University, "English for engineers and technologists" (Vol. 1& 2) combined edition, Orient Black swan, Chennai (2012)

REFERENCES

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", Orient Blackswan, Chennai, (2012)
2. www.usingenglish.com
3. www.grammar.org
4. www.audioenglish.com
5. http://www.manythings.org

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	3	3	3	3				
CO2						2		3	3	3	3	3				
CO3					3	2	3	2	3	3	2	3				
CO4									2	2	1	3				
CO5									3	3	2	3				
CO6									2	3	1	3				

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

161MA21 ENGINEERING MATHEMATICS - II L-T-P C
4-0-0 4

Programme: B.E/B.Tech (Common to all Branches) **Sem: 2 Category: BS**

Aim: To analyze the engineering problems using the techniques and the mathematical skills acquired by studying vector calculus, Laplace transform, complex variables and multiple integral

Course Outcomes: The students will be able to

CO1: Apply Laplace transform to solve first and second order differential equations with elementary Forcing function.(AP)

CO2: Classify Green's theorem to evaluate line integrals along simple closed contours on the plane. (UN)

CO3: Construct an analytic function using the properties of analytic function. (UN)

CO4: Make use of Cauchy's residue theorem for applications in Engineering. (AP)

CO5: Explain complicated real integrals using the basics of analytic functions and the complex Integration. (UN)

CO6:Apply double integration to find area between two curves.(AP)

LAPLACE TRANSFORM 12

Laplace transform – Conditions for existence – Transform of elementary functions –Basic properties – First Shifting Theorem -Transform of derivatives on tf(t) , f(t)/t and periodic functions – Transform of unit step function and impulse functions. Inverse Laplace transform by partial fraction method and Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

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(without proof) – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w = z+c, cz, 1/z, and bilinear transformation.

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 (Type I&II).

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 by Cartesian co-ordianates – Volume as a triple integral.

VECTORCALCULUS 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.

TOTAL PERIODS: 60

TEXT BOOKS

1. B.S.Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi, 2005.

2. T. Veerarajan, "Engineering Mathematics(for first year)",Fourth Edition, Tata McGraw – hill publishing company Ltd, New Delhi, 2005.

REFERENCES

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 FourthEdition, The National Publishing Company, Chennai, 2004.
3. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001.
4. Ravish R Singh,Mukul Bhatt, **"**Engineering Mathematics-I**",**McGraw Hill Education(India) Private Ltd,New Delhi.
5. Dr.P.Kandasamy,Dr.K.Thilagavathy,Dr.K.Gunavathy,S.Chand& Company Ltd.Ram Nagar, New Delhi.

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			3	3	2	3	2
CO2	3	3		2	2				2			2	3	2	3	2
CO3	3	3		2	2				2			2	3	2	3	2
CO4	3	3		2	2				2			2	3	2	2	2
CO5	3	3		2	2				2			2	3	2	3	2
CO6	3	3		2	2				3			3	3	2	3	2

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

161CY21	**ENVIRONMENTAL SCIENCE**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. (Common To All Branches) **Sem** 2 **Category:** BS

Aim: To Impart the social groups and individuals to acquire knowledge of pollution and environmental degradation

Course Outcomes: The students will be able to

CO1: Illustrate the basic concepts of environment studies and natural resources (UN)
CO2: Have knowledge about ecosystem and biodiversity. (UN)
CO3: Identify and analyze causes, effects and control measures of various types of pollution.(AP)
CO4: Analyze the knowledge about types of disaster and mitigation measures (AP)
CO5: Explain the impact of social issues. (UN)
CO6: Analyze the role of a human being in maintaining a clean environment.(AP)

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. dams and their effects on forests and tribal people–Energy resources: Growing energy needs, renewable (solar energy and wind energy) and non renewable energy sources- Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generation (block diagram only), Petroleum processing and fractions, LPG and Natural gas.

ECOSYSTEM AND BIODIVERSITY 9

ECOSYSTEM : Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem-Nitrogen cycle, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the Forest ecosystem and Aquatic ecosystems (lake and rivers) –BIODIVERSITY : Introduction to Biodiversity – Definition– Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values –India as a mega-diversity nation – Hot-spots of biodiversity

ENVIRONMENTAL POLLUTION 9

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Thermal pollution – Solid waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

SOCIAL ISSUES AND THE ENVIRONMENT 9

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, Ozone layer depletion, nuclear accidents -case studies- Goal of Green chemistry

HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – Population explosion – Family Welfare Programme – Human Rights – Value Education – HIV/AIDS –Women and Child Welfare – Role of Information Technology in Environment and human health-Case studies.

TOTAL PERIODS 45

TEXT BOOKS

1. A. Ravikrishnan, "Environmental Science and Engineering, Sri Krishna Hitech Publishing Company Private Limited, 2010.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES

1. Anubha Kaushik, C.P. Kaushik, "Environmental Science and Engineering", New Age International Publishers, 2016.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.
3. Raman Sivakumar, Introduction to Environmental Science and Engineering, Tata McGraw Hill Education Private Limited, New Delhi, 2010.
4. P.Meenakshi, Elements of Environmental Science and Engineering, PHI learning (P) Ltd., India.

Course Outcomes	Program Outcomes (POs) (ECE, CSE & EEE)												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	1	2	3	1		2	2	2	2	1		
CO2	3	2	2	2	2	2	3	1		2	2	2	2			
CO3	2	2	2	2	2	2	3	1	1	1	2	2	1	1		2
CO4	2	2	2	2	2	2	3	1		2	2	2	1	1		2
CO5	2	2	2	2	2	2	2	1	1	1	1	2				
CO6	2	2	2	2	2	2	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)

161PH21 PHYSICS OF MATERIALS L-T-P C
3 0 0 3

Programme: B.E./B.Tech **Sem:** 2 **Category:** BS
(Common To All Branches)

Aim: To endow the students with the fundamentals of physics, materials and apply new ideas in the field of Engineering and Technology.

Course Outcomes: The students will be able to

CO1: Illustrate the theory and processing of conducting, superconducting materials. (UN)
CO2: Acquire knowledge of classification of semi conducting materials. (UN)
CO3: Gain knowledge about the types of magnetic and dielectric materials and their applications. (UN)
CO4: Explain about some exciting properties of modern engineering materials.(UN)
CO5: The students will acquire knowledge about nanomaterial's and their Characterization Techniques. (UN)
CO6: Infer a clear view of material characterization techniques. (UN)

CONDUCTING MATERIALS 9

Conductors: classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.Super Conductors: properties - Types of super conductors - Applications of superconductors – SQUID, cryotron, magnetic levitation.

SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – Extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration– Hall effect –Determination of Hall coefficient – Applications.

MAGNETIC AND DIELECTRIC MATERIALS 9

Magnetic Materials: 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. Dielectric Materials: Polarization - electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation –dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

ADVANCED MATERIALS 9

Metallic glasses: Preparation, properties and applications.Shape memory alloys (SMA): Characteristics - Properties of NiTi alloy – Applications -Advantages and disadvantages of SMA. Bio Materials: Biomaterials and their Types –Uses of biomaterials - Biosensor

NANOMATERIALS & CHARACTERIZATION TECHNIQUES 9

Synthesis of nanomaterials – Chemical vapour deposition – Ball milling - Properties of nanomaterials and applications.Principle, Characterization and applications of X- Ray diffraction – Scanning Electron Microscope – Transmission Electron Microscope

TOTAL PERIODS 45

TEXT BOOK

1.Ragavan, V., "Material science and Engineering", Prentice Hall of India, 2004.

REFERENCES

1. Arumugam M., "Materials Science", Anuradha publications, Kumbakonam, 2006.
2. William D. Callister, Jr., "Material Science and Engineering", John Wiley & Sons Inc.,7th Edition, New Delhi, 2010.
3. Charles P. Poole and Frank J.Ownen., "Introduction to Nanotechnology", Wiley India, 2007
4. Charles Kittel., "Introduction to solid state Physics", John Wiley & Sons, 7th edition, Singapore, 2007

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	2	2			2	2	3	1	1
CO2	3	2	2	1		2	2	2	2			2	2	3	1	1
CO3	3	2	1	2		2	2	2	2			2	2	3	1	1
CO4	3	2	2	2		3	2	3	3			2	2	3	1	1
CO5	3	2	2	3		2	2	2	2			2	2	3	1	1
CO6	3	2	1	1		2	2	2	2			2	2	3	1	1

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

161EC21 ELECTRONIC DEVICES L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 2 Category: PC**

AIM: To enable the students to develop skills in identifying and testing electronic components and designing circuits using Semiconductor diodes, BJT and FET.

Course Outcomes: The students will be able to

CO1: Explain the semiconductor devices. (UN)
CO2: Illustrate the working principles of Transistors.(UN)
CO3: Develop the stability factor. (AP)
CO4: Explain the characteristics of FETs. (UN)
CO5: Summarize the characteristics of special semiconductor devices. (UN)
CO6: Apply the devices in various applications such as SMPS and UPS.(AP)

SEMICONDUCTOR DIODE 9

Classification of Semiconductors –Drift and diffusion current- Theory of PN junction diode – Energy band structure – diode current equation – space charge and diffusion capacitances -effect of temperature on PN Diode- break down mechanism in PN Diode-Applications: Clippers & Clampers

BIPOLAR JUNCTION TRANSISTORS 9

Construction and Operations of NPN and PNP Transistor-Configuration-I/O Characteristics of CE,CB and CC Configurations - h-Parameters for CE configuration-Comparison of CE ,CB and CC configurations- Bias Stability-Need for biasing-Fixed bias-Self bias-Stability factor-Bias Compensation

FIELD EFFECT TRANSISTORS 9

Construction and Operations of JFET - Drain and Transfer Characteristics-Parameters of JFET-Saturation Drain Current - Slope of the Transfer Characteristics at I_{DSS}-Comparison of JFET and BJT-Construction and Operation of MOSFET-Depletion Type and Enhancement Type - Comparison of MOSFET with JFET-Biasing of FET and MOSFET- Charge Coupled Devices(CCD).

SPECIAL DEVICES 9

Construction and Characteristics of Zener diode - Varactor diode – Schottky diode-PIN diode - PIN Photo diode– SCR - LASCR – TRIAC-DIAC - UJT – Photoconductive and Photovoltaic cells – LED & LCD.

POWER SUPPLIES 9

Linear Mode Power Supply - Rectifiers - Filters -Voltage regulator Using Zener diode-Regulator ICs - SMPS- UPS

TOTAL PERIODS45

TEXT BOOK

1. S. Salivahanan, N. Suresh Kumar, “Electronic Devices and Circuits”, Tata McGraw Hill, 3rdEdition, (2012).

REFERENCES

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Edition, (2006).
2. J. Millman & Halkias, Satybrata Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5thEdition (2008).

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	3		2
CO2	2	3	2	2								2	2	3		2
CO3	3	3	3	2								3	3	3		2
CO4	3	3	2	2	2	2						2	2	3		2
CO5	2	3	2	2	2	2						3	3	3		2
CO6	3	3	2	2	2	2						3	3	3		2

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

161EE21	ELECTRIC CIRCUIT THEORY	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** 2 **Category:** PC

AIM: To expose the students to the basic networks in circuits and learn about the various types of circuits.

Course Outcomes: The students will be able to

CO1: Explain the mesh and nodal analysis for AC and DC networks. (UN)
CO2: Reduce the passive networks. (AP)
CO3: Solve the problems in electric circuits by using Network theorems. (UN)
CO4: Demonstrate the Resonance circuits. (AP)
CO5: Develop the transient response for AC circuits. (AP)
CO6: Analyze three phase circuits. (AY)

BASIC CIRCUITS ANALYSIS 9

Ohm's Law – Kirchhoff's laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton's Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

RESONANCE CIRCUITS 9

Series and parallel RLC Circuits – their frequency response – Quality factor and Bandwidth.

TRANSIENT RESPONSE FOR DC AND AC CIRCUITS 9

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input-Two-Port networks (interrelationships between the parameters).

ANALYSING THREE PHASE CIRCUITS 9

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL PERIODS 45

TEXT BOOK

1. K.Mahadevan and C.Chitra, "Electric Circuits Analysis", PH1 Pvt. Ltd., New Delhi,2015.

REFERENCES

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., Second Edition, New Delhi,2000.
2. Joseph A. Edminister and Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi,2001.
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), DhanpathRai and Sons, New Delhi, (1999).
4. Charles K. Alexander and Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill,2003.

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					3	2	3		2
CO2	3	3	2	2	2		1					2	2	3		2
CO3	3	3	2	2			1					2	2	3		2
CO4	3	3	2	2			1					2	2	3		2
CO5	3	3	2	2			1					2	3	3		2
CO6	3	3	3	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)

161PC27 PHYSICS AND CHEMISTRY LABORATORY-II L-T-P C
0-0-4 2

Programme: Common to all Branches **Sem: 2 Category: BS**

AIM: To introduce the basic Physics concepts through experiments and to impart knowledge on the application of chemistry in engineering branches.

Course Outcomes: The students will be able to

CO1: Explain the rigidity modulus of the materials. (UN)
CO2: Illustrate the Young's modulus of the material. (UN)
CO3: Demonstrate the flow of liquid in capillary tube. (UN)
CO4: Extend the quantity of unknown solution by instrumental method. (UN)
CO5: Analyze the corrosion rate of a iron. (AP)
CO6: Explain the molecular weight of polymer.(UN)

LIST OF EXPERIMENTS - PHYSICS PART
(A minimum of five experiments shall be offered)

S.No **NAME OF THE EXPERIMENT**

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 a semiconductor material.
6. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.

LIST OF EXPERIMENTS – CHEMISTRY PART

S.No **NAME OF THE EXPERIMENT**

1. Esimation of HCl by pH metry
2. Conductometric titration of mixture of acids (HCl& CH_3COOH)
3. Estimation of Chloride ion in water sample by Argentometric method.
4. Determination of molecular weight of a polymer by viscometry method
5. Determination of corrosion rate by weight loss method

REFERENCES

1. Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS,London.
2. A. Ravikrishnan "Practical Engineering Chemistry", Sri Krishna Publications, Chennai,2002
3. Engineering Physics Laboratory Manual
4. Engineering Chemistry Laboratory Manual

TOTAL PERIODS 45

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		3			1	2	2		2
CO2	3	3	2	1			1		3			1	2	2		2
CO3	3	2	2	1			1		3			1	2	2		2
CO4	3	3	2	2			1		3			1	2	2		2
CO5	3	2	2	2			2		3			2	2	2		2
CO6	3	2	2	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)

161EC27	**UNIX LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Programme: B.E. Electronics and Communication Engineering **Sem:** 2 **Category:** PC

Course Outcomes: The students will be able to

CO1:Make use of basic UNIX commands and shell scripts. (AP)
CO2:Build simple shell programs. (AP)
CO3:Develop shell scripts using Conditional and Iterative statements.(AP)
CO4:Able to Work with File concepts in shell scripts.(AP)
CO5:Illustrate the shell script programs using branching statements. (UN)
CO6:Apply the C programming concepts with modern programming technique. (AP)

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

Advance C-Programs

12. Command Line Input
13. C Program using pipe
14. Initializing the Message Queues
15. File and Directory manipulation system call

SYLLABUS

1. UNIX COMMANDS

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

2. SHELL PROGRAMMING

Simple Shell program - Conditional Statements - Testing and Loops.

3. C PROGRAMMING ON UNIX

Dynamic Storage Allocation-Pointers-Functions-File Handling.

TOTAL PERIODS 45

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	1	1	2	2		2	2
CO2	2	2	2	2	2				3	1	2	2	2		2	2
CO3	3	2	2	2	2				3	1	2	2	2		2	2
CO4	3	2	2	2	2				3	1	2	2	2		2	2
CO5	2	2	2	2	2				3	1	2	2	2		2	2
CO6	3	2	2	2	2				3	1	2	2	2		2	2

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

161EC28 CIRCUITS AND DEVICES LABORATORY L-T-P C
0-0-3 2

Programme: B.E. Electronics and Communication Engineering **Sem:** 2 **Category:** **PC**

AIM: To verify the circuit theorem and study the characteristics of Electronic Devices.

Course Outcomes: The students will be able to

CO1: Build linear DC circuit using ohm's law, Kirchhoff's voltage law & Kirchhoff's current law.(AN)
CO2: Apply the circuit Theorems and concepts.(AP)
CO3: Analyze steady state linear A.C circuit containing dependent & independent sources, Resistor, capacitor and inductors.(AN)
CO4: Illustrate the characteristics of various diodes.(UN)
CO5: Interpret the characteristics of BJT and FET. (UN)
CO6: Design the circuits using software package.(AP)

LIST OF EXPERIMENTS:

Experiments on Circuits:

1.Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of Superposition Theorem.
4. Verification of Maximum Power Transfer Theorems.
5. Frequency response of series and parallel resonance circuits.

Experiments on Devices:

6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of JFET and MOSET
9. Characteristics of SCR
10. Characteristics of Photodiode.
11.Use of a software package to analyze the circuits

TOTAL PERIODS 45

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	2				3	1		1	3	3		1
CO2	3	3	3	3	2	1			3	1	1	2	3	3		1
CO3	3	3	2	3	2	2			3	1	1	2	3	3		1
CO4	3	2	2	3	2	1			3	1	1	2	3	2		1
CO5	3	2	3	3	2	1			3	1	1	2	3	3		2
CO6	3	2	3	3	2				3	1	1	2	3	3	1	2

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

161MA31	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATION**			**L-T-P**	**C**
				3-2-0	**4**
Programme:	B.E./B.Tech. (Common to all branches)	**Sem :**	**3**	**Category:**	**BS**
Aim:	The Course is aimed at Developing the basic mathematical skills of Engineering Student.				

Course Outcomes: The students will be able to

CO1: Classify the Fourier series and half range Fourier sine and cosine series. (UN)
CO2: Expalin the Fourier transform and with their properties. (UN)
CO3: Demonstrate the Z-inverse transform using convolution theorem and partial fraction method. (UN)
CO4: Solve the partial differential equation by using Lagrange's linear equation. (AP)
CO5: Analyze separation of variable to solve linear partial differential equation. (AP)
CO6: Interpret the partial differential equation. (UN)

FOURIER SERIES **12**

Dirichlet's conditions–General Fourier series–Odd and even functions–Half range sine series Half range cosine series–Complex form of Fourier Series–Parseval's identify–Harmonic analysis.

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.

PARTIALDIFFERENTIALEQUATIONS **12**

Formation of partial differential equations – Lagrange's linear equation–Solutions of standard types of first order partial differential equations (without reducing the standard type) – Linear partial differential equations of second and higher order with constant coefficients.

APPLICATIONSOFPARTIALDIFFERENTIALEQUATIONS **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.

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.

TOTAL PERIODS 60

TEXT BOOKS

1. Grewal,B.S,"Higher Engineering Mathematics",40th Edition, Khanna publishers, Delhi,(2007)
2. Dr. G. Balaji., "Transforms and Partial Differential Equation", Balaji Publishers,12th Edition November 2016, Chennai.

REFERENCES

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).
5. Dr.P.Kandasamy,Dr.K.Thilagavathy,Dr.K.Gunavathy,"Transforms and Partial Differential Equation", S.Chand & Company Ltd. Ram Nagar, New Delhi.

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								2	3	2	3	2
CO2	3	3		2								2	3	3	3	2
CO3	3	2		2								2	2	2	3	2
CO4	3	2		3								2	3	2	3	2
CO5	3	2		2								2	3	2	3	2
CO6	3	2		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)

161EC31	ANALOG ELECTRONIC CIRCUITS			L-T-P	C
				3-0-0	3
Programme:	B.E Electronics and Communication Engineering	**Sem:**	**3**	**Category:**	**PC**

AIM: Enable the student to design and analyze various electronic circuits and systems.

Course Outcomes: The students will be able to

CO1:Analyze the biasing of BJT and transistor configurations. (AN)

CO2:Carryout the frequency response characteristics of both BJT and FET amplifiers. (AP)

CO3:Design feedback amplifiers. (AP)

CO4:Discuss various types of amplifier connections for improved characteristics. (AP)

CO5:Build various power amplifiers. (AP)

CO6: Illustrate the various types of oscillators power amplifiers. (UN)

REVIEW OF DIODE AND TRANSISTOR – CHARACTERISTICS AND BIASING 9

Diode characteristics, Diode equivalent circuits, Transistor configurations – comparison - DC & AC Load Lines-Operating Point-Fixed and Self biasing - design- bias stabilization- Transistor switching circuit.

BJT AND JFET FREQUENCY RESPONSE 9

Logarithms, Decibels, Low frequency response – BJT Amplifier, Low frequency response FET Amplifier, Miller effect capacitance, High frequency response – BJT Amplifier, High frequency response-FET Amplifier, Multistage Frequency Effects.

GENERAL AND FEEDBACK AMPLIFIERS 9

Cascade connections, Cascode connections, Darlington connections. Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers.

POWER AMPLIFIERS 9

Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions, Designing of Power amplifiers, Single tuned amplifier

OSCILLATORS 9

Oscillator operation, Phase shift Oscillator, Wien bridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator, UJT Oscillator, Monostable Multivibrator, Schmitt Trigger

TOTAL PERIODS 45

TEXT BOOK

1. S. Salivahanan, N. Suresh kumar , “Electronic Devices and Circuits”, Tata McGraw Hill, 3rd Edition, 2012.

REFERENCES

1. David A Bell, “Electronic Devices and Circuits”, Prentice Hall of India, 1998.

2.Jacob Millman, Christos C Halkias, “Electron Devices and Circuits”, Tata McGraw Hill, Edition 1991

3.Donald L Schilling, Charles Belove, “Electronic Circuits”, Tata Mc Graw Hill Edition 2002, 9th reprint 2008

4. Robert Boylsted, Louis Nashelsky,” Electronic Devices and circuit Theory”, Pearson, 2009.

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	3		2
CO2	3	2	3	2	1	1						2	2	3		2
CO3	3	2	3	3	2	1						2	2	3	2	2
CO4	3	2	3	3	1	1						2	2	3	2	2
CO5	3	3	2	3	2	1						2	2	3	2	2
CO6	3	2	3	3	2	1						2	2	3	2	2

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

161EC32 DIGITAL ELECTRONICS L-T-P C
3-0-0 3

Programme: B.E Electronics and Communication Engineering **Sem: 3 Category: PC**

AIM: To provide fundamental concepts in the design of digital circuits

Course Outcomes: The students will be able to

CO1: Illustrate the number systems. (UN)
CO2: Solve the Boolean Expressions.(AP)
CO3: Build the logic gates and combinational circuits. (AP)
CO4: Develop Flip-flops and sequential circuits. (AP)
CO5: Compare the synchronous and asynchronous sequential circuits. (UN)
CO6: Classify memory devices. (UN)

NUMBER SYSTEM & MINIMIZATION TECHNIQUES 9

Number system , Binary Arithmetic Operation , 1's and 2's complements,9's and 10's complement, Classification of binary Codes, Boolean logic operations and laws , De-Morgan's Theorem , Minimization of Boolean expressions , Sum of Products (SOP) , Product of Sums (POS), Karnaugh map Minimization , Quine-McCluskey method of minimization.

LOGIC GATES & COMBINATIONAL CIRCUITS 9

Logic Gates , Mixed Logic, Multilevel Gating Networks, Logic families(TTL,ECL,RTL),Characteristics of Digital IC's, Half adder & Half Subtractor , Full Adder & Full Subtractor , Parallel binary adder, Parallel binary Subtractor, Fast Adder , Serial Adder/Subtractor , BCD adder ,Binary Multiplier, Binary Divider, Multiplexer / Demultiplexer,Decoder / Encoder , Parity checker, Parity generators , Code converters, Magnitude Comparator.

SEQUENTIAL CIRCUITS 9

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

Counters - Asynchronous & Synchronous Up/Down counter , Design of Synchronous counters.

Registers – Shift registers , Shift register counters , Sequence generators.

SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Synchronous Sequential Circuits: General Model, Classification, Design , Design using Algorithmic State Machine , Analysis of Synchronous Sequential Circuits.

Asynchronous Sequential Circuits: Design of fundamental mode , Incompletely specified State Machines.Problems in Asynchronous Circuits , Design of Hazard Free Switching circuits.

MEMORY DEVICES 9

Classification of memories , ROM , RAM , Memory decoding, Memory expansion, Programmable Logic Devices.

TOTAL PERIODS 45

TEXT BOOK

1. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2007.

REFERENCES

1. Donald D.Givone, Digital Principles and Design, TMH, 2003.
2. Donald P.Leach , Albert Paul Malvino , Goutam Shah "Digital principles & applications",7th edition ,2011
3. M.Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003/ Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

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	2	1							2	2	3		2
CO2	2	3	2	2	2							2	2	3		2
CO3	3	3	3	3	2	1			3		1	2	2	3		2
CO4	3	3	3	3	2	1			3		1	2	2	3		2
CO5	3	3	3	2	2	1						2	2	3		2
CO6	2	3	3	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)

161EC33	ELECTROMAGNETIC FIELDS			L-T-P	C
				3-0-0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	3	**Category:**	PC

AIM: To understand the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields.

Course Outcomes: The students will be able to

CO1: Compare the different co-ordinate systems. (UN)
CO2: Apply Gauss's law for the static electric fields.(AP)
CO3: Derive the boundary conditions for the dielectric materials. (UN)
CO4: Apply curl, Stokes's theorem for the steady magnetic field. (AP)
CO5: Develop the Maxwell's equations for static and time varying fields. (AP)
CO6: Solve the wave equations for plane waves and electromagnetic waves. (AP)

STATIC ELECTRIC FIELDS **9**

Introduction to Co-ordinate System: Rectangular – Cylindrical and Spherical Coordinate System, 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

DIVERGENCE, ENERGY AND POTENTIAL **9**

Divergence, Gradient, Vector operator and Divergence Theorem, Energy expended in moving a point charge in an electric field, Definition of Potential Difference and Potential, Potential field of a point charge, Energy Density in the Electrostatic Field, Poisson's and Laplace's equation. Current and Current Density, Boundary Conditions for conductors and perfect dielectric materials.

STEADY MAGNETIC FIELD **9**

Curl, Stoke's Theorem, Biot-Savart Law, Magnetic field intensity and flux density, Magnetic Field intensity due to a finite and infinite wire carrying a current I, Ampere's circuital law and its proof, Torque on a loop carrying a current I, Magnetic moment, Energy stored in magnetic field, Magnetic Vector Potential, Nature of Magnetic Materials, Magnetic Boundary Conditions.

ELECTROMAGNETIC FORCE AND TIME VARYING FIELDS **9**

The Lorentz force equation for a moving charge, Force on a differential current element, force between differential current elements, Faraday's law for electromagnetic induction, Maxwell's equations-I, II, III & IV in Point form and Integral form, Power and the Poynting vector.

ELECTROMAGNETIC WAVES **9**

Wave Equations, Wave Propagation in Lossy dielectrics, plane waves in Lossless Dielectrics, Plane waves in free space, plane waves in good conductors, skin effect, Reflection of Plane Waves - normal and oblique incidence, Brewster angle.

TOTAL PERIODS 45

TEXT BOOK

1. William H.Hayt, John.A.Buck,"Engineering Electrmagnetics", 8th Edition, Tata McGraw-Hill, 2014.

REFERENCES

1. Mathew N.O.Sadiku, "Principles of Electromagnetics", Oxford Press Int. Edition, 2009.
2. Jian – Ming Jin, "Theory and Computation of Electromagnetic Fields", IEEE Press 2015.
3. Gangadhar.K.A, "Field Theory" Khanna Publishers, 2009.

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		2							3	2	3	2
CO2	3	3	2	2		2						1	3	2	3	2
CO3	3	3	2	2		2						2	3	2	3	2
CO4	3	3	3	2	2	2						2	3	2	3	2
CO5	3	3	3	2	2	2						2	3	2	3	2
CO6	3	3	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)

161EC34 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** 3 **Category:** PC

AIM: Make the students to apply the concept of electronic instrumentation and measurements techniques.

Course Outcomes: The students will be able to
CO1: Demonstrate the basic working principles of various instrumentations.(UN)
CO2: Illustrate the operation of Analog meters and CROs for appropriate measurements.(UN)
CO3: Explain the working of signal generators and analyzers. (UN)
CO4: Measure the frequency,time interval and errors using digital Instruments.(AP)
CO5: Develop instrumentation systems for industrial processes. (AP)
CO6: Interpret the Fiber optic measurements for power and system loss.(UN)

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 and Wien bridge.

BASIC ELECTRONIC MEASUREMENTS **9**

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

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.

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.

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 PERIODS 45

TEXT BOOK

1. Albert D.Helfrick and William D.Cooper – Modern Electronic Instrumentation and Measurement Techniques, Pearson / Prentice Hall of India, 2007.

REFERENCES

1. David A. Bell, Electronic Instrumentation And Measurements, Prentice Hall Of India PvtLtd, 2003.
2. B.C. Nakra and K.K. Choudhry, Instrumentation, Meaurement and Analysis, 2ndEdition, TMH, 2004S.Ramabhadran, Electronics Measurements and Instruments, Second Edition Khanna Publishers,Delhi,2003
3. H..S.Kalsi, Electronic Instrumentation, Tata Mc Graw Hill Publications,New DELHI,2003
4. M.M.S.Anand, Electronics Instrumentation Technology,Printice Hall Of India.
5. A.J.Bowense, Digital Intruments,Tata Mcgraw-Hill Publishing Company Limited

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	2	3	2
CO2	2	3	2	2	2	2						2	2	2	3	2
CO3	3	3	2	2	2	2			2			2	3	2	3	2
CO4	2	2	2	2	2	2			2			2	3	2	2	2
CO5	2	3	2	2	2	2			2			2	2	2	2	3
CO6	3	2	2	2	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)

161EC35	DATA STRUCTURES AND C++			L-T-P	C
				3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** 3 **Category:** ES

AIM: To provide an in-depth knowledge in basic concepts of object oriented programming and fundamental concepts of data structures.

Course Outcomes: The students will be able to
CO1: Explain the concepts of object oriented programming.(UN)
CO2: Apply proper class protection mechanism to provide security.(AP)
CO3: Apply various object-oriented features for various computing problems. (AP)
CO4: Interpret the importance of structure and abstract data type, and their basic usability. (UN)
CO5: Illustrate various data structures for various computing problems. (UN)
CO6: Construct data structures for any application. (AP)

PRINCIPLES OF OBJECT ORIENTED PROGRAMMING 9

Introduction – Beginning with C++, Tokens, Expressions, Control Structures, Functions in C++, Classes and objects, Operators overloading and type conversions.

BASIC CONCEPTS OF OBJECT ORIENTED PROGRAMMING 9

Inheritance, Constructors and destructors, Pointers, Virtual functions and polymorphism, Exception handling.

LINEAR DATA STRUCTURES 9

Abstract data type (ADTs), List ADT – array based implementation – linked list Implementation, Stack ADT, Queue ADT.

NON LINEAR DATA STRUCTURES 9

Trees – Binary trees – Search tree ADT, Graph Algorithms – Representation – Shortest path algorithms: Dijkstra's algorithm – Minimum spanning tree

SORTING 9

Sorting – Preliminaries – Insertion sort, Shell sort, Merge sort, Quick sort, Indirect sorting, Bucket sort.

TOTAL PERIODS 45

TEXT BOOK

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd edition, Pearson Education Asia, 2007.

REFERENCES

1. Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition, 2007.
2. E. Balagurusamy, "Object Oriented Programming with C++", 4th edition, McGraw Hill Company Ltd., 2009.
3. Sahni,"Data Structures using C++", MC graw Hill, 2006.
4. Seymour, "Data Structures", The McGraw-Hill, 2007.
5. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002.
6. John R.Hubbard, Schaum's outline of theory and problem of data structure with C++, McGraw-Hill, New Delhi, 2000.

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							1	2		2	3
CO2	3	2	2	2	2							2	2		2	3
CO3	2	2	2	2	2	1		1				2	2		2	3
CO4	3	2	2		2							1	2		2	3
CO5	3	2	2	2	2	2		1				2	2		2	3
CO6	2	2	2	2	2	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)

161EC37 ANALOG ELECTRONIC CIRCUITS LABORATORY L-T-P C
0-0-4 2

Programme: B.E. Electronics and Communication Engineering **Sem:** 3 **Category** **PC**

AIM: To make the students to design and implement the various Electronics circuits.

Course Outcomes: The Students will be able to

CO1: Explain the transistor and FET biasing techniques.(UN)
CO2: Develop frequency responses of the transistor and FET amplifier circuits.(AP)
CO3: Illustrate the multistage amplifier circuits.(UN)
CO4: Interpret the working of power amplifiers. (UN)
CO5: Build series and shunt feedback amplifiers and various types of oscillators.(AP)
CO6: Construct tuned amplifiers and non linear wave shaping circuits.(AP)

LIST OF EXPERIMENTS

1. Biasing networks for BJT and FET (Fixed and Voltage Divider Bias methods)
2. Frequency response of Single stage BJT amplifier
3. Frequency response of Multi stage BJT amplifier
4. Frequency response of BJT Feedback Amplifiers (Voltage Shunt & Current Series)
5. Class A Power Amplifier
6. Class B Power Amplifier
7. Transistor Oscillators (RC Phase shift & Colpitts)
8. Frequency response of Single Tuned Amplifier
9. Transistor Multi vibrator (Mono stable) and Schmitt trigger using PSPICE and LabView

TOTAL PERIODS 45

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	2			3	1		2	2	3		2
CO2	3	2	3	3	2	3			3	2		2	2	3	2	3
CO3	3	2	3	3	2	2			3	2	2	2	2	3	2	2
CO4	3	2	3	3	2	2			3	2	2	2	2	3	3	2
CO5	3	3	2	3	2	2			3	2	2	2	2	3	3	2
CO6	3	2	3	3	2	3			3	2	2	2	2	3	3	2

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

161EC38 DATA STRUCTURES AND C++ LABORATORY L-T-P C
0-0-4 2

Programme: B.E. Electronics and Communication Engineering **Sem:** 3 **Category:** PC

AIM: To provide an in-depth programming skills in data structures.

Course Outcomes: The students will be able to

CO1: Explain the concepts of object oriented programming.(UN)
CO2: Apply proper class protection mechanism to provide security.(AP)
CO3: Apply various object oriented features for various computing problems.(AP)
CO4: Interpret the importance of structure and abstract data type, and their basic usability. (UN)
CO5: Illustrate various data structures for various computing problems.(UN)
CO6: Construct data structures for any application. (AP)

LIST OF EXPERIMENTS

1. Array implementation of List Abstract Data Type (ADT).
2. Linked list implementation of List ADT.
3. Array implementation of Stack ADT.
4. Linked list implementations Stack ADT.
5. Array implementation of Queue ADT.
6. Linked list implementations Queue ADT.
7. Balancing parenthesis using array and implementation of stack ADT.
8. Evaluating Postfix expression using array and implementation of stack ADT.
9. Search Tree ADT - Binary Search Tree.
10. Implementation of Heap Sort.
11. Implementation of Quick Sort.

TOTAL PERIODS 45

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	2	2				3	1	1	2	2		2	3
CO2	2	2	2	2	2				3	1	1	2	2		2	3
CO3	2	3	3	2	2				3	1		2	2		2	3
CO4	2	2	2	2	2	1			3	1	1	2	2		2	3
CO5	3	2	2	2	2				3	1		2	2		2	3
CO6	2	3	3	3	3	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)

161HS39	**FUNCTIONAL ENGLISH – I**	**L-T-P**	**C**
		0-0-2	**-**

Programme: Common to all branches **Sem 3 Category: MC**

Aim: To create an Environment to improve learner's communication skill

Course Outcomes: The students will be able to

CO1. Understand the basics of Language & Grammar relating to Business Communication. (UN)
CO2. Develop learners ability to understand Technical communication. (AP)
CO3. Extend learners ability to understand any kind of text. (UN)
CO4. Learn the nuances of effective writing by using short and crisp sentences. (UN)
CO5. Listen and understand talks and lectures on technical subjects. (UN)
CO6. Improve both speaking and writing skills. (AP)

UNIT I **10**

GRAMMAR: Parts of Speech, Tense- simple present, perfect, continuous, present perfect continuous

READING: Reading different genres of text (literature, media and technical) for comprehension, Reading for making inferences, reading news bulletins and weather forecast, advertisements

WRITING: , Writing apology letters, Writing e-mail – difference between formal and informal mails, giving information, making an enquiry, answering, announcing a job opportunity, enquiry, confirming terms, informing about a new service

LISTENING: Telephone etiquette- types of calls, greetings, making and receiving a call, transferring information, making appointments and closing a call. Listening to telephonic conversation, listening to famous personalities' speech

SPEAKING: **Role play**- planning a training course, phoning a hotel, enquiring about a new job, launching a new product, negotiating a deal and interviewing someone about a change in job. **Just a minute**- describing a business trip, the importance of internal communication of the company, describing a product and how it is advertised

UNIT II **10**

GRAMMAR: Simple past, perfect, continuous, past perfect continuous

READING: Reading technical article and making notes, Reading a technical report for gist

WRITING: Making and taking notes, writing project introduction, Writing for giving assurance and Notice, Agenda and Minutes

LISTENING: Listening to documentaries, listening to interviews

SPEAKING: Small talks- introducing oneself, remembering one's childhood, describing one's positive and negative features, making comparisons, describing abilities and skills, making requests and seeking permissions

UNIT III **10**

GRAMMAR: Simple future, perfect, continuous, future perfect continuous. Voice. Conditional Clause

READING: Cloze test, Reading and answering questions, reading job advertisements, job interviews

WRITING: Memos, writing user manuals, product review

LISTENING: Listening to group discussion

SPEAKING: Expressing personal opinion about social issues

TOTAL PERIODS: 30

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				
CO2									3	3	3	3				
CO3									3	3	3	3				
CO4									3	3	3	3				
CO5									3	3	3	3				
CO6									3	3	3	3				

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

161MA41	PROBABILITY AND RANDOM PROCESSES			L-T-P	C
				3-0-0	3
Programme:	**B.E. (Common to CSE & ECE Engineering)**	**Sem :**	**4**	**Category:**	**BS**

Aim: This course aims at providing the necessary basic concepts in random processes and to acquire skills in analyzing queuing models.

Course Outcomes: The students will be able to

CO1: Explain the discrete and continuous random variables.(UN)

CO2: Apply strictly stationary, wide–sense stationary and Poisson process.(AP)

CO3: Analyze two dimensional Random Variables. (AN)

CO4: Illustrate the binomial, Poisson, geometric, uniform, exponential and normal distribution. (UN)

CO5: Interpret Wiener - khintchine relation and correlation properties. (UN)

CO6: Build the queuing models to real world problems.(AP)

RANDOM VARIABLES **9**

Discrete and continuous random variables – Moments – Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, Normal distribution.

TWO DIMENSIONAL RANDOM VARIABLES **9**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression –Transformation of random variables – Central limit theorem (for 2D random variables).

CLASSIFICATION OF RANDOM PROCESSES 9

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 signal process.

CORRELATION AND SPECTRAL DENSITIES **9**

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

QUEUEING THEORY **9**

Markovian models – Birth and Death Queueing models- Steady state results: Single and multiple server queueing models- queues with finite waiting rooms- Little's Formula.

TOTAL PERIODS 45

TEXT BOOKS

1. Balaji.G, "Probability and Queueing theory", Balaji Publishers, 12th Edition, November 2016.

2. Gross.D and Harris.C.M, "Fundamentals of Queueing Theory", Wiley Student edition, 2004.

REFERENCES

1.Miller.S.L and Childers.D.G, "Probability and Random Processes with applications to Signal Processing and Communications, Elsevier Ine.,First Indian Reprint 2007.

2.Stark.H and Woods.J.W, "Probability and Random Processes & 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, 004.

4.Leon-Garcia,A, "Probability and Random Processes for Electrical Engineering",Pearson Education Asia, 2nd Edition, 2007.

5.Allen.A.O, "Probability, Statistics and Queueing Theory with ComputerApplications", Elsevier, 2nd edition, 2005.

Course outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		2								3	3	1	3	2
CO2	2	2		2								1	3	1	3	2
CO3	3	3		3								3	3	1	3	2
CO4	2	2		3								1	3	2	3	3
CO5	3	3		3								2	3	2	3	2
CO6	3	3		2								3	3	2	3	2

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

161EC41	ANALOG COMMUNICATION	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem: 4** **Category: PC**

AIM: To study the various analog modulation and demodulation techniques, transmitters & receivers used in communication systems.

Course Outcomes: The Students will be able to

CO1: Examine the principles of communication system and analog modulation techniques(UN)
CO2: Compare different amplitude modulation schemes. (UN)
CO3: Design the angle modulation circuits in communication systems.(UN)
CO4: Apply the probability theory to examine the characteristics of various noises in communication systems. (UN)
CO5: Analyze the noise performance of AM and FM systems.(AN)
CO6: Design various analog pulse modulation circuits.(AP)

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.

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, – Capture effect, threshold effect.

NOISE **9**

Mathematical definition of a Random Process, Stationary processes, Mean, Correlation and Covariance functions, Ergodic Processes, Power Spectral Density, Gaussian process, Shot noise, thermal noise, white noise, narrowband noise, noise temperature, noise figure.

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.

ANALOG PULSE MODULATION **9**

Types of Pulse modulation,-Principles and output wave forms of PAM,PWM and PWM-Generation & demodulation of PAM, PWM,PPM - Frequency Division Multiplexing- Time Division Multiplexing.

TOTAL PERIODS 45

TEXT BOOK

1.Simon Haykin, “Communication Systems”, John Wiley & sons, 5th Edition, 2010.

REFERENCES

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. Lathi.B.P, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford Press,2007.
5. John G. Proakis, Masoud Salehi, "Fundamentals of Communication Systems", Pearson Education, 2006.

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	3	2	2
CO2	3	2	2	2								2	3	2	2	2
CO3	3	2	2	2	3	2	2					2	3	3	2	2
CO4	3	2	2	2								2	3	2	2	2
CO5	3	3	2	2	2	3	2					2	3	2	2	2
CO6	3	2	2	2	3	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)

161EC42	LINEAR INTEGRATED CIRCUITS			L-T-P	C
				3-0-0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	4	**Category:**	**PC**

AIM: To learn the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

Course Outcomes: The students will be able to

CO1: Demonstrate the manufacturing of IC's and fabrication of active and passive components.(UN)

CO2: Examine the operational amplifier stages and its ac, dc performance characteristics.(UN)

CO3: Analyze the applications of operational amplifier.(AP)

CO4: Elaborate the concepts of analog multiplier IC and PLL IC.(UN)

CO5: Classify and explain the types of digital-to-analog and analog-to-digital converters.(UN)

CO6: Apply special function ICs to design different types of waveform generators and explain the basics of IC regulators.(AP)

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. General operational amplifier stages and internal circuit diagrams of IC 741 – Current mirror and current sources – DC and AC performance characteristics – Slew rate – Open and Closed loop configurations.

APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Scale Changer – Adder and Subtractor – Instrumentation amplifier – Phase Shift Circuits – Voltage Follower – V-to-I and I-to-V converters – Peak detector – Clipper and Clamper – Logarithmic amplifier – Antilogarithmic amplifier – Differentiator – Integrator – Comparators – Schmitt trigger – Precision rectifier – Low-pass, high-pass and band-pass filters.

ANALOG MULTIPLIER ICs AND PLL ICs 9

Analog Multiplier ICs and its applications — Operation of the basic PLL, Closed loop analysis of PLL, Voltage Controlled Oscillator(VCO)-IC VCO NE/SE566, Block diagram of PLL IC 565 and its applications for frequency synthesizing, frequency multiplication and division.

A/D AND D/A CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - Weighted resistor type, R-2R Ladder type, Voltage Mode R-2R Ladder and Current-Mode R-2R Ladder types - Sampling Process-High speed sample and hold circuit, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type - Dual Slope type - A/D Converter using Voltage-to-Time Conversion.

WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs 9

Sine-wave generators, Multivibrators, Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555-GeneralDescription - Monostable and Astable operation of Timer IC 555 – LM317 adjustable voltage regulators - IC 723 general purpose regulator - Frequency to Voltage and Voltage to Frequency converters using IC VFC32

TOTAL PERIODS 45

TEXT BOOK

1.Roy Choudhry.D, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd.,4thEdition, 2014.

REFERENCES

1. Salivahanan.S& KanchanaBhaskaran.V.S., "Linear Integrated Circuits", 2nd Edition, McGraw Hill 2008.

2. Sonde.B.S., "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 edition, 2001.

5. Michael Jacob.J, "Applications and Design with Analog Integrated Circuits", PHI, 1996.

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	2	2	2									1	2	3	2	2
CO3	3	2	3	2	2	2			1			2	2	3	2	2
CO4	3	2	2		1	1			1			2	2	3		2
CO5	2	2	2	1	1	1			2			2	2	3	2	2
CO6	3	2	2	2	2	1			1			2	2	3	2	2

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

161EC43 SIGNALS AND SYSTEMS L-T-P C
3-2-0 4

Programme: B.E. – Electronics and Communication Engineering **Sem: 4 Category: PC**

AIM: To study and analyze the characteristics of continuous, discrete signals and systems.

Course Outcomes: The students will be able to

CO1:Explain the principles and properties of signals and systems. (UN)
CO2:Compute Fourier Series / Transform of the continuous time signals. (AP)
CO3:Analyze the continuous time systems in frequency domain. (AN)
CO4:Apply Laplace Transform to Continuous Time Signals and Systems. (AP)
CO5:Apply Z transform to characterize Discrete Time Signals. (AP)
CO6:Analyze the systems using impulse response and convolution. (AN)

CLASSIFICATION OF SIGNALS AND SYSTEMS 12

Basic signals, Classification of signals - Continuous and Discrete signals, Periodic and Aperiadic signals, Deterministic and Random signals, Energy and Power signals - Classification of systems – Continuous and Discrete systems, Static and Dynamic, Linear and Nonlinear, Time-variant and Time-invariant, Causal and Non causal, Stable and Unstable.

ANALYSIS OF CONTINUOUS TIME SIGNALS 12

Fourier series analysis-spectrum of Continuous Time signals- Fourier and Laplace Transforms in Continuous Time Signal Analysis – Properties of Fourier and Laplace Transforms.

LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS 12

Differential Equation-Block diagram representation-impulse response, convolution integrals- Laplace transform in Analysis of CT systems.

ANALYSIS OF DISCRETE TIME SIGNALS 12

Baseband Sampling - Aliasing, Reconstruction of CT signal from DT signal- DTFT – Properties of DTFT - Z Transform – Properties of Z Transform.

LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 12

Difference Equations-Block diagram representation-Impulse response - Convolution sum-DiscreteFourier and Z Transform Analysis of Recursive & Non-Recursive systems.

TOTAL PERIODS 45

TEXT BOOK

1. Simon Haykins and Barry Van Veen, “Signals and Systems”, Second Edition, John Wiley and Sons, Reprint 2012.

REFERENCES

1. Lathi.B.P, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
2. Zeimer.R.E, Tranter.W.H and Fannin.R.D, “Signals & Systems - Continuous and Discrete”,Pearson, 2007.
3. Roberts.M.J, “Signals & Systems Analysis using Transform Methods & MATLAB”, Tata McGraw Hill, 2007.
4. Allan V.Oppenheim, Wilsky.S and Nawab. S.H, “Signals and Systems”, Pearson, 2007.

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	1
CO2	3	3	2	2	2							2	3		3	1
CO3	3	3	3	3	2							2	3		3	2
CO4	3	3	3	3	2							2	3		3	2
CO5	3	3	3	3	2							2	3		3	2
CO6	3	3	3	2	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)

161EC44	TRANSMISSION LINES AND WAVE GUIDES			L-T-P	C
				3-0-0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	4	**Category:**	PC
AIM:	To lay a strong foundation on the theory of transmission lines and networks by highlighting their applications.				

Course Outcomes: The students will be able to

CO1: Interpret the propagation of signals through transmission lines.(UN)
CO2: Develop the prototype m-derived filters and attenuators. (AP)
CO3: Model the two port networks. (AP)
CO4: Apply matching networks for loaded transmission lines. (AP)
CO5: Explain the linear Radio frequencies. (UN)
CO6: Compare the different types of waveguides. (UN)

TRANSMISSION LINE THEORY **9**

Need for Transmission Lines, Types of Transmission lines, Transmission line Equation –General solution, Infinite line – wavelength, velocity of Propagation, waveform distortion , the distortion less line, Loading and different method of loading, Reflection coefficient , Input impedance and transfer impedance ,open and short circuit lines, Insertion loss

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. Symmetrical two port networks: T and π Equivalent of a two port network - Characteristic impedance and propagation constant of a symmetrical two port network.

IMPEDANCE MATCHING **9**

Impedance Matching, Quarter wave line, single stub and double stub matching-smith chart-solution of Problems using smith chart-single and double stub matching

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 –Power and impedance measurement on lines, Reflection losses, Measurement of VSWR and wavelength.

WAVE GUIDES AND CAVITY RESONATORS **9**

General Wave behaviours along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves in Rectangular wave guides, TM and TE waves in Circular wave guides.

TOTAL PERIODS 45

TEXT BOOKS

1.John D Ryder, “Networks lines and fields”, 2nd Edition, Pearson Publisher, 2015Prentice Hall of India, New Delhi, 2005
2.William H.Hayt,”Engineering Electromagnetics”, Tata McGraw-Hill,2011.

REFERENCES

1.Sudhahar.A, Shyammohan S.P, "Circuits and Networks:Analysis and Synthesis", Tata McGraw Hill, New
Delhi, 5th Edition, 2015.
2.David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc, Delhi, 2004
3.D.RoyChoudhary, "Network and Systems", New Academic Science, 2nd Edition, 2013.

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								2	3		3	2
CO2	3	3	2	3	3							2	3	2	3	2
CO3	3	3	2	2	2							2	3	2	3	2
CO4	3	3	2	2		1			1			2	3	2	3	2
CO5	2	3	3	2	2							2	3		3	2
CO6	3	3	2	3	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)

161EC45	ELECTRICAL ENGINEERING	L	T	P	C
		3	0	2	4

Programme: B.E. Electronics And Communication Engineering **Sem: 3** **Category** **PC**

AIM: To learn the concepts of various types of electrical machines and transmission and distribution of electrical power.

Course Outcomes: The students will be able to

CO1: Explain the construction and principle of DC Machines.(UN)

CO2: Illustrate the working of transformer. (UN)

CO3: Demonstrate the synchronous machine operation with their phasor diagram. (UN)

CO4: Interpret induction motors and its speed control characteristics. (UN)

CO5: Apply suitable special machines for industrial systems. (AP)

CO6: Explain the operation of special machines. (UN)

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.

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.

SYNCHRONOUS MACHINES **9**

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

INDUCTION MOTORS **9**

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

SPECIAL MACHINES **9**

Stepper motor -AC series motor-Universal motor- Reluctance motor-Linear Induction Motor.

LIST OF EXPERIMENTS

1. Speed control of DC shunt motor.
2. Load Test on DC series motor.
3. Load test on DC Shunt Motor.
4. Open and Short Circuit tests on single phase transformer.
5. Load test on three phase Induction motor.
6. Load test on single phase transformer.
7. Load test on single phase Induction motor.
8. Study of Starters: for AC motors and DC motors.

TOTAL PERIODS 60

TEXT BOOK

1.Theraja.B.L, "A Text Book of Electrical Technology", Volume II,(AC & DC Machines),S.Chand& company Ltd, New Delhi, Reprint 2015.

REFERENCES

1.Bandyopadhyay.M.N, "Electrical Machines-Theory and Practice" PHI Learning, 3rd Edition, 2011.
2. Nagrath.I.J, Kothari.D.P, "Electric Machines", TMH, 2003.
3.Gupta J.B, "Theory and Performance of Electrical machines", S.K.Kataria & Sons, NewDelhi 2009

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	2	2			3	1		2		3		3
CO2	3	2	3	3	2	2			3	1	2	2		3		3
CO3	3	3	2	2	2	2			3	1		2		3		3
CO4	3	3	2	2	2	2			3			1		3		3
CO5	3	3	2	2	2	2			3	1		2		3		3
CO6	3	2	3	3	2	2			3	1		2		3		3

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

161EC47	INTEGERATED CIRCUITS LABORATORY			L-T-P	C
				3-0-0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	**4**	Category	PC

AIM: To make the students to design and implement the various Electronics circuits using Linear and digital ICs.

Course Outcomes: The students will be able to

CO1: Construct arithmetic and logic circuits using logic gates. (AP)

CO2: Build various combinational logic circuits using logic gates. (AP)

CO3: Develop the sequential logic circuits by using flip flops. (AP)

CO4: Implement various applications of Op- amp IC741. (AP)

CO5: Analyze multivibrator using IC 555 Timer. (AN)

CO6: Apply PLL IC to design frequency multiplier. (AP)

LIST OF EXPERIMENTS:

DIGITAL ICs

1. Study of Logic gates.
   - **a)** Basic Logic gates.
   - **b)** Universal Logic gates.
   - **c)** Exclusive Logic gates.
2. Design and implementation of Arithmetic circuits.
   - a) Half adder and Full adder.
   - b) Half subtractor and Full subtractor..
3. Design and Implementation of Code Converters.
4. Design and Implementation of Multiplexer and De-multiplexer.
5. Design and Implementation of Magnitude Comparator.
6. Design and Implementation of Encoder and Decoder.
7. Design and Implementation of Flip Flop.
8. Design and Implementation of Shift Registers.
9. Design and Implementation of Counters.

LINEAR ICs

1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Astable multivibrator and Schmitt Trigger using Op-amp.
4. Astable & Monostable multivibrators using NE555 Timers.
5. Phase shift and Wien bridge oscillators using op-amp.
6. PLL characteristics and its use as Frequency Multiplier.

TOTAL PERIODS 45

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	1	2	2	2	3	3	2
CO2	3	2	2	2	3				3	1	2	2	2	3	2	2
CO3	2	3	2	3	3	2			3	1	2	2	2	3	2	3
CO4	3	3	3	3	3				3	1	2	2	2	3	3	2
CO5	2	2	2	2	3				3	1	2	2	3	3	3	2
CO6	3	3	2	2	3	1			3	1	2	2	2	3	3	2

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

161EC48 ENGINEERING SOFTWARE LABORATORY L T P C
0 0 4 2

Programme: B.E. Electronics and Communication Engineering **Sem:** **4** Category P C

AIM: To introduce the basic building blocks of linear, digital integrated circuits.

Course Outcomes: The students will be able to

CO1: Interpret power and energy of the signal. (UN)

CO2: Apply convolution of the sequences and perform signal transformation. (AP)

CO3: Build arithmetic and Boolean operations using Labview. (AP)

CO4: Examine convolution of signals and sorting numbers in an array. (AN)

CO5: Illustrate the characteristics of diodes to design rectifying circuits. (UN)

CO6: Examine different types of filters and frequency response of various amplifier circuits using simulation Software. (AN)

LIST OF EXPERIMENTS:

List of Experiments

Experiments using Scilab:

1.Obtain discrete signal from analog signal

2.Determine power and energy given signal

3.Observe the time shifting and time scaling using sinusoidal and exponential signals

4.Obtain DFT using FFT

5.Determination of the linear convolution of given two sequences

Experiments using Labview:

1.Basic arithmetic and boolean operations

2.Sum of ‘n’ numbers using ‘For’ Loop

3.Factorial of a given number using For Loop

4.Sum of ‘n’ Natural numbers using While Loop

5.Factorial of a given number using While Loop

Experiments using Simulation Software

1. Verification of the characteristics of Low pass and High pass Filter
2. Verification of the characteristics of Half–Wave and Full-Wave Rectifier
3. Frequency Response of CE Amplifier
4. Frequency Response of CC Amplifier
5. Design of Wein-Bridge Oscillator

TOTAL PERIODS 45

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			3	1	1	2	2		3	2
CO2	3	3	3	2	3	1			3	1	1	2	2		3	2
CO3	3	3	2	2	3	1			3	1	1	2	2	2	3	3
CO4	3	3	3	2	3	1			3	1	1	2	2		3	2
CO5	3	3	3	2	3	1			3	1	1	2	3	3	2	2
CO6	3	3	3	2	3	1			3	1	1	2	2	3	2	2

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

161HS49	FUNCTIONAL ENGLISH – II	L-T-P	C
		0-0-2	-

Programme: Common to all branches **Sem:** 4 **Category:** MC

Aim: To Create an Environment to experiment communication skills with Intermediate resources

Course Outcomes: The students will be able to

CO1. Develop the spirit of accurate and appropriate basic communication. (AP)
CO2. Apply different forms of advanced grammar. (AP)
CO3. Recall words and their meaning quickly for effective communication. (UN)
CO4. Develop students' accuracy in Written Communication. (AP)
CO5. Improve Communication Skills in formal and informal situations. (AP)
CO6. Combine the key points for group discussion and general interaction. (UN)

UNIT I **6**

GRAMMAR: Concord and Sentence structure
READING: Reading a passage and finding an error, reading charts, tables, graphs and making inference
WRITING: Creative writing-paragraph and essay writing, writing memo
LISTENING: Listening to short conversation, instructions and directions
SPEAKING: Describing- what I enjoy about my studies, describing about the history of a company, describing various designations in the company, describing a product and how it is advertised, describing the selection process of a company

UNIT II **6**

GRAMMAR: If clause
READING: Reading leaflet and pamphlets, reading for gathering information
WRITING: Writing report, proposals
LISTENING: Listening to lectures and ted talks
SPEAKING: Mini presentation on technical topics- English for presentations- Difference between lecture speech and presentation- what makes a good presentation-planning, purpose, audience, gathering information, using av materials, gestures, and interaction ability

UNIT III **6**

GRAMMAR: Reported speech
READING: Reading and interpreting visual material, reading online content and reading technical reports
WRITING: Writing product review, writing instructions and recommendations
LISTENING: Listening to technical presentation, speeches and interviews
SPEAKING: Group discussion, general interaction

TOTAL PERIODS 30

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				
CO2											3	3				
CO3												3				
CO4										3		3				
CO5									3	3	3	3				
CO6									3	3	3	3				

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

161EC51 CONTROL SYSTEMS L-T-P C
3-0-0 3

Programme: B.E. – Electronics and Communication Engineering **Sem: 5 Category: PC**

AIM: To familiarize the students with concepts related to the operation analysis and stabilization of Linear and Digital control systems.

Course Outcomes: The students will be able to
CO1: Build the models of various physical systems. (AP)
CO2: Explain the time domain responses of I and II systems. (UN)
CO3: Classify the transient and steady state performance of a system. (UN)
CO4: Analyze the control system performance in frequency domain. (AN)
CO5: Compute Z transform of discrete time systems. (AP)
CO6: Solve the equation for state model. (AP)

CONTROL SYSTEM MODELING 9

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph.

TIME DOMAIN ANALYSIS 9

Standard test signals- First order system - step, ramp and impulse response analysis-Second order system – step response analysis- steady state error – generalized error co-efficient - Principle of PI, PD and PID controllers

FREQUENCY DOMAIN ANALYSIS 9

Frequency Response - Bode Plot, Polar Plot. - Frequency Domain specifications from the plots - Constant M and N Circles - stability analysis – Routh Hurwitz criterion – Root locus method- Nyquist stability criterion.

DIGITAL CONTROL SYSTEM 9

Basic digital control system –Spectrum analysis of sampling process –Signal reconstruction-Difference equation representation of digital control systems-Pulse transfer function-Inverse Z transform- Response of linear discrete time systems-Stability analysis – Jury's stability criterion

STATE VARIABLE ANALYSIS 9

Concepts of state, state variables and state model -State space representation of continuous time systems – State equations – Transfer function from state variable representation – Solutions of the state equations.

TOTAL PERIODS 45

TEXT BOOK

1. Nagrath.J and Gopal.M, "Control System Engineering", New Age International Publishers, 5th Edition, 2009.

REFERENCES

1. Benjamin.C.Kuo, "Automatic Control Systems", Prentice Hall of India, 9th Edition, 2009.
2. Gopal.M, "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. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall, 2010.

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	2	2	3
CO2	3	3	3	2	2							2	2		2	3
CO3	3	3	3	3	2							2	2		2	3
CO4	3	3	3	3	2							2	2		2	3
CO5	3	3	3	3	2							2	2		2	3
CO6	3	3	3	3	2							2	2		2	3

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

161EC52 DIGITAL COMMUNICATION L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** 5 **Category:** PC

AIM: To introduce the basic concepts of Digital Communication in baseband and pass band domains and to give an exposure to error control coding techniques.

Course Outcomes: The students will be able to

CO1: Demonstrate the waveform encoding and source coding techniques. (UN)
CO2: Construct Error control coding techniques. (AN)
CO3: Analyze PAM signals. (AP)
CO4: Explain the Baseband data transmission process. (AP)
CO5: Develop the Digital modulation techniques. (AP)
CO6: Identify the wireless communication systems. (AP)

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

ERROR CONTROL CODING 9

Discrete memoryless channels - Linear block codes - Cyclic codes - Convolutional codes -Maximum likelihood decoding of convolutional codes-Viterbi Algorithm

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, Baseband M-ary PAM Systems, adaptive equalization for data transmission

DIGITAL MODULATION SCHEME 9

Generation, detection, PSD & BER of Coherent ASK,BPSK, BFSK & QPSK - QAM – Carrier, Synchronization - structure of Non-coherent Receivers - Principle of DPSK.

SPREAD SPECTRUM MODULATION 9

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

TOTAL PERIODS45

TEXT BOOK

1. Simon Haykins, “Digital Communications” Wiley India edition,2009

REFERENCES

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

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)

161EC53	VLSI DESIGN	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem: 5** **Category: PC**

AIM: To introduce theConcepts of VLSI design using the CMOS technology and CMOS Design.

Course Outcomes: The students will be able to

CO1: Illustrate the electrical characteristics of MOS transistors and CMOS fabrication technology.(UN)
CO2: Analyze the performance parameters of CMOS devices. (AN)
CO3: Design static and dynamic CMOS combinational and sequential logic circuits. (AN)
CO4: Interpret various system design methods. (US)
CO5: Construct CMOS arithmetic circuits. (AP)
CO6: Classify the various levels of CMOS IC testing. (UN)

MOS TRANSISTOR THEORY AND CMOS PROCESSING TECHNOLOGY 9

Introduction,MOS Device Design Equation,CMOS Inverter DC transfer characteristics , Pseudo NMOS inverter ,Transmission gate,Tristate inverter ,nwell CMOS process technology ,CMOS process Enhancement, Layout Design Rules,Latchup,Technology related CAD issues.

DEVICE CHARACTERIZATION AND PERFORMANCE ESTIMATION 9

Resistance and Capacitance Estimation, Switching Characteristics,CMOS Transistor sizing, Power dissipation, Charging ,Design margin, Reliability and Scaling of MOS transistor circuit.

COMBINATIONAL AND SEQUENTIAL LOGIC DESIGN IN CMOS 9

Static and Dynamic CMOS Design, Power Consumption in CMOS gates, Static and Dynamic Sequential circuits,Non-Bistable Sequential circuits.

SYSTEM DESIGN AND DESIGN METHODS 9

Design Straregies,CMOS Chip Design-Programmable Logic, Programmable Interconnect, Programmable Gate Arrays, Gate Array Design, Standard Cell Design, Full Custom Design, Design methods-Design Capture and Verification tools,Arthimetic Circuits in CMOS-Bit Adder, Ripple Carry Adder Circuits,CLA,Multiplier,FSM.

CMOS TESTING 9

Need for Testing, Manufacturing Test Principles, Design Strategies for Test, Chip Level and System Level Test Techniques.

TOTAL PERIODS 45

TEXT BOOKS

1.Neil H.E Weste & Kamaran Eshraghian,Principles of CMOS VLSI Design,2nd Edition,Pearson Education,2010
2.John P.Uyemura,Introduction to VLSI Circuits and Systems,John Wiley & Sons Private Ltd,2002

REFERENCES

1.Weste and Harris: CMOS VLSI DESIGN (fourth edition) Pearson Education, 2010
2. Pucknell. D.A& K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003
3.Samura Palnitkar –verilog HDL –Guide to digital design and synthesis , 3rd edition , Pearson Education 2003
4.Jan Rabaey.M,Digital Integrated Circuits :A design Perspective, secong Edition fifth reprint Prentice Hall 2002.

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	3	3	1	2
CO2	3	3	3	1	2	2						2	3	3	1	2
CO3	3	3	3	3	3	3			3		2	2		3	1	3
CO4	3	3	3	3	3	2			3		2	2		3	1	3
CO5	3	3	3	1	2	2						2		3	1	3
CO6	3	3	3	3	3	2						2		3	1	3

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

161EC54 **ANTENNAS AND WAVE PROPAGATION** **L-T-P** **C**

3-0-0 **3**

Programme: B.E. Electronics and Communication Engineering **Sem: 5** **Category: PC**

AIM: Enable the student to interpret the various types of antennas and wave propagation.

Course Outcomes: The students will be able to

CO1: Identify properties of plane waves such as the relationship between E & H field, propagation constant and free space impedance. (UN)

CO2: Find the Pointing vector and identify the power flow direction. (UN)

CO3: Evaluate the radiation field from an infinitesimal dipole, Evaluate the characteristics of dipole antennas.(AP)

CO4: Evaluate and draw the antenna array factor for linear uniform array.(UN)

CO5: Summarize how to steer antenna beam in a linear uniform array. (AN)

CO6: Design, analysis and measurement of special antenna. (AN)

ANTENNA FUNDAMENTALS **9**

Antenna parameters: Radiation pattern, Beam solid angle- Directivity, Gain, Input impedance - Polarization, Bandwidth - Reciprocity, Equivalence of Radiation patterns, Equivalence of Impedances - Effective aperture - Vector effective length, Antenna temperature.

WIRE ANTENNAS AND ANTENNA ARRAYS **9**

Wire antennas: Short dipole, Radiation resistance and Directivity - Half wave Dipole, Monopole, Small loop antennas- Antenna Arrays: Linear Array and Pattern Multiplication- Two-element Array, Uniform Array, Polynomial representation - Array with non-uniform Excitation-Binomial Array.

APERTURE ANTENNAS **9**

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

SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS **9**

Special 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 - Base station antennas, Wireless antennas. Antenna Measurements: Radiation Pattern measurement - Gain and Directivity Measurements - Anechoic Chamber measurement.

RADIO WAVE PROPAGATION **9**

Calculation of Great Circle Distance between any two points on earth - Ground Wave Propagation, Free-space Propagation, Ground Reflection - Surface waves, Diffraction, Wave propagation in complex Environments - Tropospheric Propagation, Tropospheric Scatter. Ionospheric propagation: Structure of ionosphere, Sky waves, skip distance, Virtual height, Critical frequency, MUF, Electrical properties of ionosphere. Effects of earth's magnetic fields

TOTAL PERIODS 45

TEXT BOOKS

1. John D Kraus, Ronald J Marhefka, Ahmad S Khan, "Antennas and Wave Propagation", Tata Mc Graw Hill Education Pvt Ltd,4th edition,first reprint,2010
2. Robert E.Collin, " Antennas and Radiowave Propagation",Mc Graw Hill Education, 2013

REFERENCES

1.Constantine A,Balanis “Antenna Theory: Analysis and Design”, John Wiley Publishers, 2003.
2.Griffiths.H, Encianas.J, Papiernik.A& Serge Drabowitch “Modern Antennas”, Chapman & Hall, 2005.
3.Prasad.K.D “Antenna and Wave Propagation”, Satya prakashan, 2008.

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	3	2		2
CO2	3	3	3	2	2							2	3	2		2
CO3	3	3	3	3	2	2						2	3	2		2
CO4	3	3	3	3	2							1	3	2	2	2
CO5	3	3	2	3	2	2						1	3	2	2	2
CO6	3	3	3	3	2	2						2	3	2	2	2

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

161EC55 DIGITAL SIGNAL PROCESSING L-T-P C
3-2-0 4

Programme: B.E. Electronics and Communication Engineering **Sem: 5** **Category: PC**

AIM: To study the signal processing methods and its applications.

Course Outcomes: The students will be able to

CO1: Compute the DFT and FFT of discrete time signals. (UN)
CO2: Model IIR Butterworth and Chebyshev filter. (AP)
CO3: Construct digital FIR filters using windowing technique. (AP)
CO4: Estimate power spectrum using parametric and non-parametric methods. (UN)
CO5: Build multirate filters. (AP)
CO6: Develop digital filter banks. (AP)

DISCRETE FOURIER TRANSFORM 12

Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering, Sectionalized convolution-overlap add and save procedure.

IIR FILTER DESIGN 12

Design of analogue Butterworth and Chebyshev Filters - IIR filter design by Impulse Invariance and Bilinear transformation - pre warping - Realization using direct, cascade and parallel forms.

FIR FILTER DESIGN 12

Symmetric and Antisymmetric FIR filters - Linear phase FIR filter - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window and Blackmann Windows), Frequency sampling techniques - Realization of FIR filters – Transversal, Linear phase and Polyphase structures.

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

APPLICATIONS 12

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Applications of Multirate signal processing: Design of Phase Shifters, Implementation of Narrowband Lowpass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals

TOTAL PERIODS 60

TEXT BOOKS

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

REFERENCES

1. Ifeachor.E.C and Jervis.B.W, “Digital signal processing - A practical approach”, Pearson, 2nd Edition, 2002.
2. Moman .H. Hays, “Digital Signal Processing”, Schaum’s outlines, Tata McGraw-Hill Co Ltd.2004.
3. Ramesh Babu.P,“Digital Signal Processing ”, Scitech Publications , 4th Edition, 2011.

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							2	2		3	
CO2	3	3	3	3	3							2	2	2	3	2
CO3	3	3	3	3	3							2	2	2	3	2
CO4	3	3	2	2	2							2	2		3	
CO5	3	3	2	3	3							2	2	2	2	2
CO6	3	3	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)

161EC56 MICROPROCESSORS AND MICROCONTROLLERS L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 5 Category: PC**

AIM: To learn the architecture, programming, interfacing and rudiments of system design of microprocessors and microcontrollers.

Course Outcomes: The students will be able to

CO1: Explain about architecture and instruction set 8085 microprocessor. (UN)
CO2: Build Assembly Language Programming for microprocessor. (AP)
CO3: Illustrate how to interface peripherals with microprocessor. (UN)
CO4: Construct Assembly language programming with 8051 microcontroller. (AP)
CO5: Build simple applications using open source Arduino board. (AP)
CO6: Construct programming with Raspberry Pi. (AP)

BASIC MICROPROCESSOR ARCHITECTURE **9**

Architecture of 8085-Pin configuration-Instruction set-Addressing modes- Memory interfacing– I/O interfacing – Simple assembly language programming.

9

PERIPHERALS INTERFACING WITH 8085

Programmable Peripheral Interface (PPI 8255) –Programmable Interval Timer (PIT 8253) – 8259 Programmable Interrupt Controller – keyboard & display controller (8279) – Interfacing serial I /O (8251)- Direct Memory Access (8237) – ADC/DAC interfacing.

9

8051 MICROCONTROLLER

8051 Architecture- Instruction set – Addressing modes – Assembly language programming- Special function Registers

9

OPEN SOURCE ARDUINO ARCHITECTURE

Functional Block Diagram of Arduino (Atmega328) –Functions of each Pin of Arduino –Arduino Development Board diagram –Programming of an Arduino – Arduino Boot loader –Initialization of Serial Port using Functions.

9

PROGRAMMING WITH RASPBERRY PI

Introduction – Raspberry Pi models – connecting various peripherals – Network configuration – Raspberry pi software configuration tool – Pi as Home theatre – Web server – Productivity machine.

TOTAL PERIODS 45

TEXT BOOKS

1.Krishna Kant, Microprocessors and microcontrollers Architecture , Programming and System design 8085,8086,8051,8096,PHI-Third Printing-2010.
2.Alan G. Smith “Introduction to Arduino” CreateSpace Independent Publishing Platform ,2011.

REFERENCES

1. Ramesh S Gaonkar,” Microprocessor Architecture, Programming and application with 8085”, 6th Edition, Prentice Hall, New Delhi,2013.
2. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware”,TMH,2012.
3. Steven F.Barrett “Arduino Microcontroller Processing For Every One” 3rd Edition Morgan & Claypool Publishers ,2017.

4. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.
5. Eben Upton, Gareth Halfacree "Raspberry Pi User Guide (Paperback)" Wiley 3rd edition, 2014.

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		3
CO2	3	2	3	3	2	2			2		2	2	2	2		3
CO3	3	2	3	2	3	2			3		2	2	2	2		3
CO4	2	2	2	2	2				2		1	2	2	2		3
CO5	3	3	3	3	3	2			2		2	3	2	2	2	3
CO6	3	3	2	2	2	2			2		2	3	2	2	2	3

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

161EC57 COMMUNICATION SYSTEMS LABORATORY L-T-P C
0-0-4 2

Programme: B.E. Electronics and Communication Engineering **Sem:** 5 **Category:** **PC**

AIM: To expose the students in analog communication and digital communication

Course Outcomes: The students will be able to

CO1: Explain the operation of sampling and time division multiplexing. (UN)
CO2: Build different Modulation and demodulation circuits in analog communication. (AP)
CO3: Demonstrate base band signaling schemes through implementation of FSK, PSK and DPSK (UN)
CO4: Apply various channel coding schemes. (AP)
CO5: Construct end-to-end Communication Link. (AP)
CO6: Interpret the functional modules of a communication system. (UN)

LIST OF EXPERIMENTS

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. Pre-emphasis and De- emphasis
5. FM Modulator and Demodulator
6. Pulse Code Modulation and Demodulation
7. Delta Modulation and Demodulation
8. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
9. Line coding schemes
10. FSK, PSK and DPSK schemes (Simulation)
11. Error control coding schemes - Linear Block Codes (Simulation)
12. Communication link simulation
13. Equalization – Zero Forcing & LMS algorithms(simulation)

TOTAL PERIODS45

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		3	2
CO2	3	3	2	2	2	1			3	1	2	2	3	2	3	2
CO3	3	3	3	2	2				3	1	2	2	2	2	3	2
CO4	3	3	2	2	3	1			3	1	2	2	2		2	2
CO5	3	3	2	2	2				3	1	2	2	3		2	2
CO6	3	3	2	2	2	1			3	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)

161EC58 **VLSI LABORATORY** **L-T-P** **C**
0-0-4 **2**

Programme: B.E. Electronics and Communication Engineering **Sem:** 5 **Category:** **PC**

AIM: To introduce the students to design the analog and digital circuits by means HDL languages and Layout tool.

Course Outcomes: The students will be able to

CO1: Compile the HDL code for basic as well as advanced digital integrated circuits.(AP)
CO2: Estimate Place and Route of the digital IPs.(AN)
CO3:Construct the logic modules into FPGA Boards.(AP)
CO4: Design the test bench for all the digital circuits.(CR)
CO5: Design the layouts of Analog IC Blocks using EDA tools.(AN)
CO6: Compile and Extract the layouts of Analog IC Blocks using EDA tools.(AP)

LIST OF EXPERIMENTS

1. Design and implementation of Adders and Subtractors.
   a.Half adders
   b.Half Subtractor
   c.Full adder
   d.Full Subtractor.
2. Design and implementation of fast adder.
3. Design and implementation of Combinational Circuits.
   a.Multiplexer & Demultiplexer
   b.Encoder & Decoder
   c.Parity generator and checker
   d.Magnitude Comparator
4. Design and implementation of flip flops (SR,D,JK,T)
5. Design and implementation of Shift registers(SISO,SIPO,PISO,PIPO)
6. Design and implementation of Asynchronous and Synchronous up/down Counter.
7. Design and implementation of Sequence generator.
8. Design and implementation of FSM.
9. Study of Placing, Rooting and Back annotation for FPGAs.
10. Study of FPGA board and testing on board LEDs and switches using verilog code.
11. Design a Layout for CMOS inverter ,CMOS NAND,CMOS NOR using layout tool.

TOTAL PERIODS 45

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	2	2	2	3	3		3
CO2	3	3	2	2	1				3	2	2	2	3	3		3
CO3	3	2	3	3	2	1			3	2	2	2	2	3		3
CO4	3	3	3	2	2	1			3	2	2	2	3	3		3
CO5	3	2	3	3	2	1			3	2	2	2	2	3	3	3
CO6	3	3	2	2	1				3	2	2	2	2	3	3	3

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

161HS59	**CAREER ENGLISH - I**			**L-T-P**	**C**
				0-0-2	**0**
Programme:	B.E. Electronics and Communication Engineering (Common to all branches)	**Sem**	**5**	**Category:**	**MC**
AIM:	To improve learners' Communication Skills in English.				

Course Outcomes: The students will be able to
CO1:Develop Language Skills, Soft Skills, Inter Personal Skills, Decision Makingand Business Communication. (AP)
CO2:Competent in presentation skill. (AP)
CO3:Imbibe the knowledge of effective classroom speaking and presentation. (UN)
CO4:Provide opportunities to learners to practice their communicative skills to become proficient users of English.(UN)
CO5:Improve time management and stress management. (AP)
CO6:Write job applications. (AP)

Elements of effective presentation – Structure of presentation – Presentation tools –Voice Modulation – Audience analysis – Body language – Video samples

Time management – Articulateness – Assertiveness – Psychometrics –Innovation and Creativity – Stress Management & Poise – Video Samples.

Covering letter- strategies to write, resume and it's various kinds.

TOTAL PERIODS 30

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1									3	3	3	3				
CO2										3		2				
CO3									2	3		2				
CO4									2	3		2				
CO5								3		3						
CO6									3	3						

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

161EC61 EMBEDDED SYSTEMS L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 6 Category: PC**

AIM: To allow the student to undertake the design and development process for embedded computer systems in relation to the environment in which they operate and to know how to integrate embedded hardware, software, and operating systems to meet the functional requirements of embedded applications.

Course Outcomes: The students will be able to

CO1:Recognize the difference between general computing system and the embedded system.(UN)

CO2:Develop various device drivers for embedded products.(AP)

CO3:Apply knowledge on the architecture and software aspects of ARM processor.(AP)

CO4:Construct real time embedded systems using the concepts of RTOS. (AP)

CO5:Identify the internal design process of real time embedded products.(AP)

CO6:Elaborate the real-life case studies of embedded systems.(AN)

INTRODUCTION TO EMBEDDED SYSTEMS 9

Definition and Classification – Characteristics of embedded systems –Challenges of embedded systems – Overview of processors and hardware units in an embedded system – Software embedded into the system – Exemplary embedded Systems –Embedded system design process.

DEVICES DRIVERS ,BUSES AND INTERRUPT SERVICING MECHANISM 9

Overview of Embedded programming in ALP and C – Device drivers – Parallel port device drivers in a system- Serial port device drivers in a system- Device drivers for internal programmable timing devices – Embedded Buses – 1^2C- USB and CANBuses- Interrupt servicing mechanism – Context and period for context switching- Deadline and Interrupt latency

EMBEDDED ARM PROCESSOR 9

The ARM7TDMI Architecture – General purpose registers, CPSR, SPSR, ARM memory map, data format- load and store architecture- ARM development tools.

REAL TIME OPERATING SYSTEMS 9

Definitions of process, tasks and threads –Operating system services- Goals and structures - Kernel services – Concept of semaphores - RTOS task scheduling models – Co-operative Round Robin scheduling – Cyclic scheduling with time slicing– Preemptive scheduling model – Critical section service by a preemptive scheduler – Fixed (static) real time scheduling of tasks – Priority inversion problem and deadlock situations.

APPLICATIONS OF EMBEDDED SYSTEMS 9

Case Studies on Model train controller – Digital Camera – biomedical application –Software modem – Network router- IVRS systems- GPS systems.

TOTAL PERIODS 45

TEXT BOOKS

1. Rajkamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill, 2^{nd}Edition , 2009.
2. Steve Furber, ARM system on chip architecture 2^{nd} edition, Addision Wesley publishers, 2000.

REFERENCES

1. Steve Heath, "Embedded Systems Design", 2nd Edition, Elsevier Publications, 2002.
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. Wayne Wolf, "Computers as Components – Principles of Embedded Computer System Design", 3rd Edition Morgan Kaufmann Publisher, 2006.

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	2	2		3
CO2	3	2	3	2	2	2						2	2	2		3
CO3	2	3	3	3	3	2						2	2	2		3
CO4	3	3	3	2	3	3			2		2	2	2	2		3
CO5	2	3	2	2	2	2						2	2	2		3
CO6	2	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)

161EC62 DSP ARCHITECTURE AND APPLICATIONS L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** 6 **Category:** PC

AIM: The purpose of this course is to expose the students to a class of DSP Architectures and to implement some typical applications.

Course Outcomes: The students will be able to

CO1: Illustrate the architecture of 2100 family of processors. (UN)
CO2: Explain FFT algorithms, FIR filters and IIR filters using ADSP. (UN)
CO3: Interpret the architecture of TMS320C54X, C55X and C6X processors. (UN)
CO4: Develop DSP algorithms. (AP)
CO5: Build code optimization techniques. (AP)
CO6: Analyze the frame processing and scheduling techniques. (AN)

ADSP 21XX ARCHITECTURE AND PROGRAMMING 9

Overview of finite word length effects – Quantization- Truncation and Rounding errors -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.

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.

TMS320C6X ARCHITECTURE 9

Architecture of DSP chip TMS320C54x and TMS320C55x, 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.

CODE OPTIMIZATION 9

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

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 PERIODS 45

TEXT BOOKS

1. Nasser Kehtarnavaz and Mansour Keramat, “DSP System design using the TMS320C600”, Prentice hall, 2001.
2. Venkataramani.B and Bhaskar.M “Digital Signal Processors-Architecture, Programming and Applications” TMH, second edition, 2008.

REFERENCES

1. Digital Signal Processing Applications using the ADSP – 2100 Family", Volume 1 Analog devices, DSP Division Prentice Hall, 1992.
2. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, 4th Edition, 2011.
3. Sophocles J.Orfanidis,"Introduction to Signal Processing", Prentice Hall, 2009.
4. Sen M.Kuo ,Bob H.Lee, "Real – Time Digital Signal Processing- Implementations, Applications and Experiments with the TMS320C55x" , Third Edition,John Wiley and Sons, 2013.

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)

161EC63 MICROWAVE ENGINEERING L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** 6 **Category:** PC

AIM: To instill knowledge on the properties of various microwave components and deal with the microwave generation and microwave measurement techniques

Course Outcomes: The students will be able to
CO1: Explain microwave passive components.(UN)
CO2: Develop knowledge about microwave semiconductor devices. (AP)
CO3: Examine TEDs (AN)
CO4: Analyze avalanche transit time devices. (AN)
CO5: Summarize about microwave tubes. (UN)
CO6: Infer the basic concepts of MMIC Fabrication and Microwave Measurements. (UN)

MICROWAVE PASSIVE COMPONENTS 9

Introduction-Microwave frequencies- Microwave devices- Microwave Systems-Microwave Applications -Scattering matrix - Concept of N port scattering matrix representation- Properties of S matrix - S matrix formulation of two-port junction- Microwave Hybrid Circuits-Directional Couplers-Circulators and Isolators-Gyrator-Terminations –Attenuators- Cylindrical Cavity resonators.

MICROWAVE SEMICONDUCTOR DEVICES 9

Microwave Bipolar Transistors-Hetero junction Bipolar Transistors(HBTs)-Microwave Tunnel Diodes - Microwave Field Effect Transistors: Introduction-JFETs-MESFETs-HEMTs-MOSFETs-CCDs

TEDs & AVALANCHE TRANSIT TIME DEVICES 9

Transferred Electron Devices -Gunn diode-RWH Theory-Modes of Operation-LSA Diodes-InP Diodes-CdTe Diodes-Microwave Generation and Amplification Avalanche Transit time devices- IMPATT Diodes-TRAPATT Diodes-BARITT Diodes-Parametric Devices

MICROWAVE TUBES 9

Microwave Linear Beam Tubes(O Type): Introduction-Conventional Vacuum Triodes, Tetrodes and Pentodes-Klystrons-Reflex klystron-Helix Travelling Wave Tubes - Microwave Crossed Field Tubes(M Type):Introduction –Magnetron Oscillators-Forward Wave Crossed Field Amplifier-Backward Wave Crossed Field Amplifier

MMIC AND MICROWAVE MEASUREMENTS 9

Monolithic Microwave Integrated Circuits: Materials and fabrication Techniques
Microwave measurements: Measurement of power, wavelength, impedance, SWR, attenuation, Q and Phase shift

TOTAL PERIODS 45

TEXT BOOK

1. Samuel Y Liao, “Microwave Devices & Circuits” , Prentice Hall of India, 2006.

REFERENCES

1. Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata Mc Graw Hill Inc.,2004.
2. Radmanesh M.M, RF & Microwave Electronics , Pearson Education, 2007.
3. Robert E.Colin, 2nd edition “Foundations for Microwave Engineering”, McGraw Hill, 2007
4. Pozar D.M, “Microwave Engineering.”, John Wiley & sons, Inc., 2006

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)

161HS61	ENGINEERING ECONOMICS AND MANAGEMENT			L-T-P	C
				3-0-0	3
Programme:	B.E. Electronics and communication Engineerings	**Sem**	**6**	**Category:**	**HS**

AIM: To impart knowledge about basics of economics and cost analysis related to engineering so as to take economically sound decisions

Course Outcomes: The students will be able to

CO1: Explain the fundamentals of economic concept (UN)
CO2: Illustrate the production and human resource management (UN)
CO3: Infer the various functions of management (UN)
CO4: Identify inflation and its types (AP)
CO5: Utilize the cost benefit in project profitability (AP)
CO6: Relate the cost and replacement (UN)

FUNDAMENTALS OF ECONOMICS **9**

Concept and scope of engineering economics - basic concepts of goods, utility, value and wealth - relation between economic decision and technical decision - Law of demand & supply – factors influencing demand - elasticity of demand – demand forecasting - Basic economic problems - causes, types and measures to control Poverty, Un employment and Inflation.

THEORY OF PRODUCTION **9**

Theory of production; production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur) - Law of variable proportions & law of returns to scale - Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection - Corporate Social Responsibility; meaning, importance - Business Ethics; meaning, importance.

FUNCTIONS OF MANAGEMENT **9**

Introduction to Management & administration, skill, types and roles of managers – Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory – Functions of Management – Planning, Organizing, Staffing, Directing, Controlling – Organizational Structures; meaning, principles of organization, types (explanation with merits and demerits), span of control, departmentalization.

DEPRECIATION AND REPLACEMENT ANALYSIS **9**

Depreciation – various methods of depreciations – inflation adjusted decisions – procedure to adjust inflation – Types of maintenance – types of replacement problem - determination of economic life of an asset – replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender.

COST ANALYSIS **9**

Types of costing – traditional costing approach – activity base costing – cost output relationship in the short run and in long run – types of pricing and its practice – appraising project profitability – internal rate of return – payback period – net present value – cost benefit analysis –feasibility reports- break even analysis - managerial uses of break even analysis.

TOTAL PERIODS 45

TEXTBOOKS

1. Dewett K.K. &Varma J.D., "Elementary Economic Theory",S Chand & Co., 2006.
2. Suma Damodaran, "Managerial economics", Oxford University press 2006.

REFERENCES

1. Sharma,K.K , "Principle of Economics", Abishek publications,2002.
2. PanneerSelvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

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				
CO2			3				2	3				3				
CO3			3				2	2				3				
CO4			3				2					3				
CO5			3				2					3				
CO6			3				2					3				

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

161EC67 EMBEDDED SYSTEMS LABORATORY L-T-P C
0-0-4 2

Programme: B.E. - Electronics and Communication Engineering **Sem: 6** **Category: PC**

AIM: The aim of the course is to provide practical hands-on experience with programming embedded microcontrollers &applications and interfacing techniques

Course Outcomes: The students will be able to

CO1: Construct simple ALPs with 8085 and 8051(AP)
CO2: Build I/O interfacing programs with 8051(AP)
CO3: Make use of Keil IDE for simple programming with ARM processor(AP)
CO4: Develop LCD interface and LED pattern design programs with Arduino board (AP)
CO5: Develop Robotics Application with Raspberry Pi(AP)
CO6: Design basic RTOS application(AP)

LIST OF EXPERIMENTS

1. Simple Assembly language programming using 8085 and 8051.
2. Configuring and interfacing 8051 I/O ports using KEIL IDE.
3. Interfacing and programming of Traffic light controller using 8051.
4. Interfacing, Programming of Stepper Motor /Servo Motor& DC Motor Speed control.
5. Basic programming concepts using ARM Processor.
6. LED and Buzzer using ARM Processor.
7. Making different LED pattern design using Arduino Board.
8. Buzzer/LCD interface using Arduino Board
9. Develop Robotics Application using Raspberry Pi.
10. Basic RTOS Application Design.

TOTAL PERIODS 45

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	3	2			3	1	2	2	2	2		3
CO2	3	2	2	2	2	2			3	2	2	2	2	2		3
CO3	3	2	2	3	2	2			3	1	2	2	2	2		3
CO4	3	3	2	2	3	2			3	1	2	3	2	2		3
CO5	2	2	3	2	3	2			3	2	2	2	2	2		3
CO6	2	2	3	2	3	2			3	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)

161EC68 DSP AND PROCESSORS LABORATORY L-T-P C
0-0-4 2

Programme: B.E. Electronics and Communication Engineering **Sem:** 6 **Category:** PC

AIM: The purpose of this course is to develop skills of the students in implementing Digital signal Processing techniques using MATLAB and Processors.

Course Outcomes: The students will be able to

CO1: Illustrate the algorithms of Digital Signal Processing techniques like convolution and Fourier Transform. (UN)

CO2: Make use of Integrated Development Environment (Code Composer Studio)for Digital Signal Processor. (AP)

CO3: Interpret the architecture of Digital Signal Processors. (UN)

CO4: Construct linear and circular convolution. (AP)

CO5: Analyze the different types of filters using DSP Processor and Matlab.(AN)

CO6: Build adaptive filters for various applications of DSP. (AP)

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of sequences (functional & random)
2. Linear and Circular Convolutions
3. FIR filter design
4. IIR filter design
5. Multirate Filters
6. Determination of Power Spectrum of a given signal

DSP PROCESSOR BASED IMPLEMENTATION

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

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

TOTAL PERIODS 45

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)

161EC69	**MINI PROJECT**	**L-T-P**	**C**
		0-0-2	**1**

Programme: B.E. Electronics and Communication Engineering **Sem** **VI** **Category** **EEC**

AIM: To develop a simplified electronic circuits and communication system model suitable for various application.

Course Outcomes:

The students will be able to

CO1: Identify suitable problem in electronic circuits and communication systems. (UN)
CO2: Apply the knowledge of fundamental engineering. (AP)
CO3: Design and develop a suitable solution for the problem.(UN)
CO4: Enhance the technical and non-technical Knowledge.(AN)
CO5: Optimize the performance cost. (AP)
CO6: Prepare documentation of observed results and maintain team work. (UN)

Syllabus Contents:

The students are required to search / gather the material / information on a specific a topic Comprehend it and present / discuss in the class. They can take up small problems in the field of design engineering as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, conducting experiments on various engineering subjects, material characterization, studying a software tool for the solution of an engineering problem.

Total Periods 30

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	1	1	3	1	2	2	3	2	2	3
CO2	3	2	2	2	2	1			3	1	2	2	3	2	2	3
CO3	3	3	2	2	2		1	1	3	1	2	1	3	2	2	3
CO4	3			2	2	1			3	1	2	2	3	2	2	3
CO5	3	3	3	2	2	1	1		3	1	2	2	3	2	2	3
CO6	3				2				3	1	2	2	3	2	2	3

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

161HS69 **CAREER ENGLISH - II** **L-T-P** **C**
0-0-2 **0**

Programme: Common To All Branches **Sem: 6** **Category: MC**

AIM: To practice English for Enhancing Employability skills.

Course Outcomes: The students will be able

CO1:Explain aptitude and reasoning skills. (UN)
CO2:Illustrate the principles of various stages in English communication. (UN)
CO3:Practice English for Enhancing Employability skills. (AP)
CO4:Develop students job prospects through oral communication. (AN)
CO5:Enhance the performance of learners at placement interviews and group discussions and other recruitment procedures. (AP)
CO6:Improve presentation skills.(AP)

Verbal analogy, verbal reasoning, error spotting, sentence completion.

Why is GD part of selection process ?- Structure of GD – Moderator - Strategies in GD – Team work - Body Language - Mock GD -Video samples

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

1. Resume / Report Preparation
2. Presentation Skills: Students make presentations on given topics. (8)
3. Group Discussion: Students participate in group discussions. (6)
4. Interview Skills: Students participate in Mock Interviews (8)

TOTAL PERIODS 30

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				
CO3									2	3	2	2				
CO4										3						
CO5									3	2						
CO6										3						

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

161EC71 WIRELESS COMMUNICATION L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category:** **PC**

AIM: To study and analyze the Wireless .communication systems

Course Outcomes: The students will be able to

CO1:Infer the various modern wireless communication systems.(UN)

CO2:Explain the cellular concepts of wireless communication systems.(UN)

CO3:Analyze the wireless channel characteristics - path loss, propagation mechanisms.(AN)

CO4:Analyze the small scale radio propagation models and prediction of their effects.(AN)

CO5:Categorize the signal combining techniques, equalization and diversity.(UN)

CO6:Apply the concept of MIMO to mitigate fading effects.(AP)

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.

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

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

SIGNAL PROCESSING IN WIRELESS SYSTEMS 9

Principle of Diversity, Macro diversity, Micro diversity, Signal Combining Techniques, Transmit diversity, Equalizers- Linear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques

4G NETWORK ARCHITECTURE AND MIMO SPATIAL MULTIPLEXING 9

LTE – Evolution to 4G – Network Architecture -MIMO Spatial Multiplexing – MIMO capacity – Code words and Layer Mapping – Downlink MIMO transmission chain – MIMO Precoding – CDD based precoding – Open loop spatial multiplexing

TOTAL PERIODS 45

TEXT BOOK

1. Rappaport. T.S., "Wireless communications", Pearson Education,2nd edition, 2010.

REFERENCES

1.Andreas.F. Molisch, "Wireless Communications", John Wiley – India, Reprint 2008.
2. Sanjay Kumar ,'Wireless Communications Fundamental & Advanced Concepts', ,River publishers,2015
2.SimonHaykin& Michael Moher, "Modern Wireless Communications", Pearson Education, 2007..
3.Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd.,3rdedition, 2011.
4.Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

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	3		3	2
CO2	3	2	3	2	3	2						2	3		3	
CO3	3	3	2	2	2	1						2	3		3	
CO4	3	3	3	2	2	2	1					2	3		3	
CO5	3	3	3	2	2							2	3		3	2
CO6	3	2	2	2	2	1						2	3		3	2

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

161EC72 FIBER OPTIC COMMUNICATION L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 7 Category: PC**

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 Outcomes: The students will be able to

CO1: Elaborate about the basic elements of optical fiber transmission link, Fiber modes Configurations and structures.(US)
CO2: Examine the different fiber optical sources and photo detectors.(AN)
CO3: Compare and analyze the performance of different photo detectors.(UN)
CO4: Categorize Fiber Power Launching and Fiber Coupling.(AN)
CO5: Construct optical transmission media and Optical receiver.(AP)
CO6: Analyze the basic SONET/SDH, WDM &CDMA concepts in optical networks.(AN)

INTRODUCTION TO OPTICAL FIBERS 9

Overview of Optical Fiber Communication : Evolution of Fiber Optic Systems-Elements of an Optical Fiber Transmission Link – Basic Optical Laws and Definitions - Optical Fiber Modes and Configurations- Mode Theory for Circular Waveguides - System performance .Mode Single Mode Fibers - Graded Index fiber structure - Losses in optical fibers-Attenuation & Dispersion.

FIBER OPTICAL SOURCES & PHOTO DETECTORS 9

Light Emitting Diodes - Laser Diodes - Comparison and Applications - Physical principles of Photodiodes, Photo detector Noise, Detector Response Time - Avalanche Multiplication Noise - Comparisons of Photo detectors.

POWER LAUNCHING AND COUPLING 9

Source to Fiber Power Launching- Lensing Schemes for Coupling Improvement – Fiber to Fiber Joints-LED Coupling to Single Mode Fibers-Fiber Splicing-Optical Fiber Connectors

DIGITAL TRANSMISSION SYSTEMS & OPTICAL RECEIVERS 9

Point to Point links - Noise effect on System Performance – Fundamental Receiver Operations – Digital Receiver Performance –Detailed Performance Calculations- Pre amplifier Types - Analog receiver.

WDM CONCEPTS AND OPTICAL NETWORKS 9

Operational Principles of WDM – SONET/SDH Transmission Formats and Speeds- Optical Interfaces-SONET/SDH Rings- SONET/SDH Networks-Broadcast and Select WDM Networks -Wavelength Routed Networks - Nonlinear Effects on Network Performance- Solitons - Optical CDMA-Ultrahigh Capacity Networks.

TOTAL PERIODS 45

TEXT BOOK

1.Gerd Keiser "Optical Fiber Communications", McGraw Hill, New Delhi, 3rd edition, 2008.

REFERENCES

1. Franz J.H. Jain V.K, "Optical Communication, Components and systems", Narosa publications, New Delhi, 2000.
2. Mynbaev.K 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.
4. John M. Senior,"Optical Fiber Communication" Pearson Education – Second Edition. 2007

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							1	3	2	1	2
CO2	3	2	3	2	2	1						1	3	2	2	2
CO3	3	3	2	2	2	1						1	2	2	2	2
CO4	3	2	2	2	2	1						2	2	2	2	2
CO5	3	3	2	3	2	1						1	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)

161EC73	RF CIRCUITS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category:** PC

AIM: To become familiar with RF Components and Its Circuit Design.

Course Outcomes: The students will be able to
CO1: Explain the working of RF Components. (UN)
CO2: Build the RF Circuit Model. (AP)
CO3: Interpret the Concepts of Matching Networks. (UN)
CO4: Develop the RF Filters using Passive Components. (AP)
CO5: Build the RF Amplifiers. (AP)
CO6: Illustrate the RF Oscillators and Mixer. (UN)

RF COMPONENTS **9**

Introduction: Importance of RF Design, Frequency Spectrum-RF Behavior of Passive Components- Chip Components and Circuit Board Considerations.
Active RF Components: RF Diodes - Schottky Diode, PIN Diode, Varactor Diode,
Tunnel Diode ,IMPATT, TRAPATT, BARRITT and Gunn Diodes - RF Field Effect Transistors-High Electron Mobility Transistors

ACTIVE RF COMPONENTS MODELLING **9**

Diode Models: Non Linear Diode Model, Linear Diode Model-Transistor Models: Large Signal BJT Models, Small Signal BJT Models, Large Signal FET Models, Small Signal FET Models. Scattering Parameter Device Characterization

MATCHING NETWORKS & AN OVERVIEW OF RF FILTER DESIGN **9**

Impedance Matching Using Discrete Components – Micro strip line Matching Networks. Basic Resonator and Filter Configurations – Special Filter Realizations - Filter Implementation-Coupled Line Filters - Filters using Coupled Resonators

RF TRANSISTOR AMPLIFIER DESIGN **9**

Characteristics of Amplifiers-Amplifier Power Relations-Stability considerations-Constant gain-Noise Figure circles-Constant VSWR Circles-Broadband ,High power and Multistage Amplifiers

OSCILLATORS AND MIXERS **9**

Basic Oscillator Model: Negative Resistance Oscillator-Feedback Oscillator design–Design Steps – Quartz Oscillators. High frequency Oscillator configuration: Fixed Frequency oscillators-Dielectric Resonator Oscillator-YIG Tuned Oscillator-Voltage Controlled oscillator-Gunn Element Oscillator. Basic Characteristics of Mixers

TOTAL PERIODS 45

TEXT BOOKS

1. Reinhold Ludwig & Pavel Bretchko, "RF Circuit Design – Theory and Applications", 2nd edition., Pearson Education,2011
2. David M.Pozar , "Microwave Engineering" , 4th.,John Wiley &Sons (ASIA) Pt Ltd, 2011 .

REFERENCES

1. Coleman C., “An introduction to Radio Frequency Engineering”, Cambridge, 2004.
2. Mathew M. Radmanesh, “Advanced RF & Microwave Circuit Design – The Ultimate Guide to System Design”, Pearson Education Asia, 2009.
3. Joseph J. Carr, “RF Components and Circuits”, Newnes, 2002.
4. Inder Bahl, “Fundamentals of RF and Microwave Transistor Amplifiers”, John Wiley & Sons, 2009.

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	1
CO2	3	2	3	3	3							2	3	3	2	2
CO3	3	3	2	2								2	3	2	2	2
CO4	3	3	3	2								2	3	3	2	2
CO5	3	3	3	2	3							2	3	3	2	2
CO6	3	2	2	2								2	3	2	2	2

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

161EC74 COMPUTER NETWORKS L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category:** **PC**

AIM: To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

Course Outcomes: The students will be able to

CO1:Identify the components required to build different types of networks.(AP)

CO2:Know the functionalities of each layer of the network.(UN)

CO3:Explain the functions of data link layer and standards.(UN)

CO4:Analyze the network layer and various protocols.(AN)

CO5:Compare and classify various internal routing protocols of Transport layer.(UN)

CO6:Elaborate the application of DNS, Email, FTP, HTTP concepts.(UN)

FUNDAMENTAL AND 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.

DATA LINK LAYER **9**

Data link control: Framing – Flow and error control –Protocols for Noiseless and Noisy Channels – HDLC -Wired LANS : Ethernet – IEEE standards – standard Ethernet – changes in the standard – Fast Ethernet – Gigabit Ethernet– 10 Gigabit Ethernet. Wireless LANS : IEEE 802.11–Bluetooth– WiMAX.

NETWORK LAYER **9**

Logical addressing: IPv4, IPv6 , Internet Protocol: Internetworking – IPv4– ICMPv4 – Next generation IP: IPv6– ICMPv6–, Delivery - Forwarding – Routing – Unicast, routing protocols- Distance Vector Routing and Link State Routing.

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.

APPLICATION LAYER **9**

Domain Name System (DNS) – E-mail (MIME,SMTP, POP3, IMAP4) – FTP – WWW – HTTP - Digital signature

TOTAL PERIODS45

TEXT BOOK

1. Behrouz A. Foruzan, “Data communication and Networking”, Fifth Edition,Tata McGraw-Hill, 5th edition 2013.

REFERENCES

1. Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education.2009
2. James . Kurose.F& Rouse .W, "Computer Networking: A Topdown Approach Featuring",3/e, Pearson Education.2010
3. Greg Tomshon, Ed Tittel, David Johnson. "Guide to Networking Essentials", fifth edition, Thomson India Learning, 2007.
4. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.

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					2			3	3	2		3
CO2	3	3	2	2								2	3			2
CO3	3	3	3	2	3				2			2	3			2
CO4	3	2	3	3								2	3			2
CO5	3	3	2	3	2	1			3			2	3			2
CO6	3	3	3	3		1						2	3			2

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

161EC77 **MICROWAVE AND OPTICAL LABORATORY** **L-T-P** **C**
0-0-4 2

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category:** **PC**

AIM: To Study various Microwave Components and its S Parameters measurementand setup Simple Optical Link and analyze its performance

Course Outcomes: The students will be able to
CO1: Examine microwave and optical components. (UN)
CO2: Analyze the performance of fiber optic link. (AN)
CO3: Observe the characteristics of microwave sources. (UN)
CO4: Develop the radiation of pattern of antenna. (AP)
CO5: Discover S Parameters for any Microwave Passive Components.(AN)
CO6: Discover losses in Microwave and optical fibers Link.(AN)

LIST OF EXPERIMENTS

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- frequency response(analog) and eye diagram (digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

MICROWAVE EXPERIMENTS
1. Reflex klystron or Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2. Directional Coupler Characteristics.
3. Radiation Pattern of Horn Antenna.
4. S-parameter Measurement of the following microwave components (Isolator, Circulator, E plane Tee, H Plane Tee, Magic Tee)
5. Attenuation and Power Measurement

TOTAL PERIODS 45

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)

161EC78 **COMPUTER NETWORKS LABORATORY** **L-T-P** **C**
0-0-4 **2**

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category:** **PC**

AIM: To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

Course Outcomes: The students will be able to

CO1: Construct the Parallel communication between PC's.(AP)
CO2: Design of Routing Protocols. (AP)
CO3: Compare the various routing algorithms. (AP)
CO4: Develop socket Program. (AP)
CO5: Analyze QOS parameters using Simulation tools.(AN)
CO6: Simulate data encryption and Decryption. (AP)

LIST OF EXPERIMENTS

1. PC to PC Communication
   Parallel Communication using 8 bit parallel cable Serial communication using RS 232C
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.
11. Study of Network Simulator (NS2) and Simulation of Congestion Control Algorithms using NS2.

TOTAL PERIODS45

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				3		1	2	3		3	2
CO2	3	3	2	2	2				3		1	2	3		2	2
CO3	3	3	2	2	2				3		1	2	2	2	2	2
CO4	3	2	2	2	2			1	3			2	2		2	2
CO5	3	2	2	3	2				3			2	2		2	2
CO6	3	2	2	3	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)

161EC89 **PROJECT WORK** **L T P C**

0 0 12 6

Programme: B.E Electronics and Communication Engineering **Sem: 8** **Category: EEC**

Aim: To develop students knowledge for solving technical problems through structured project research study in order to produce competent and sound engineers.

Course Outcomes: The Students will be able to

CO1: Make use of new tools. (AP)
CO2: Identify new ideas for solving problems.(AP)
CO3: Know the key stages in enhancing the project.(UN)
CO4: Analyze solutions for real-world Problems.(AN)
CO5: Build the prototype.(AP)
CO6: Write a comprehensive report on the project work.(AN)

Syllabus content:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

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)

PROGRAMME ELECTIVES

161ECE01	SATELLITE COMMUNICATION	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To become familiar with satellites and satellite services.

Course Outcomes: The students will be able to
CO1: Identify the fundamentals of satellite orbital mechanics. (AP)
CO2: Develop launching methods and technologies. (AP)
CO3: Examine the concept of Antenna TV Systems and transmission losses. (AN)
CO4: Illustrate the accurate link budget for a satellite or other wireless communications link. (US)
CO5: Analyze modern modulation and multiple access techniques in satellite systems. (AN)
CO6: Infer about various satellite application. (UN)

SATELLITE 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 .

SPACE SEGMENT AND SATELLITE LINK DESIGN 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.

SATELLITE ACCESS 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.

EARTH SEGMENT 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.

SATELLITE APPLICATIONS 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 PERIODS45

TEXT BOOK

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006

REFERENCES

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. Richharia.M : Satellite Communication Systems (Design Principles Macmillan Press Ltd. Second Edition 2003.

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)

161ECE03 COGNITIVE RADIO L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** **PE**

AIM: To know the basics of the software defined radios and understand the concepts of wireless networks and next generation networks.

Course Outcomes: The students will be able to

CO1: Elaborate the basics of the software defined radios.(UN)
CO2: Analyze the various design principles of software defined radio.(AN)
CO3: Construct the wireless networks based on the cognitive radios.(AP)
CO4: Examine the concepts behind the artificial intelligence techniques.(AN)
CO5: Build the architecture of cognitive radio.(AP)
CO6: Analyze the next generation wireless networks.(AN)

INTRODUCTION TO SOFTWARE DEFINED RADIO 9

Definitions and potential benefits, software radio architecture evolution, technology tradeoffs andarchitecture implications.

SDR ARCHITECTURE 9

Essential functions of the software radio, basic SDR, hardware architecture, Computationalprocessing resources, software architecture, top level component interfaces, interface topologiesamong plug and play modules.

INTRODUCTION TO COGNITIVE RADIOS 9

Marking radio self-aware, cognitive techniques – position awareness, environment awareness incognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

COGNITIVE RADIO ARCHITECTURE 9

Cognitive Radio - functions, components and design rules, Cognition cycle - orient, plan, decide andact phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture onSoftware defined Radio Architecture.

NEXT GENERATION WIRELESS NETWORKS 9

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrumsharing, upper layer issues, cross – layer design.

TOTAL PERIODS45

TEXT BOOKS

1. Joseph Mitola,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.
2. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE .2009.

REFERENCES

1. Simon Haykin, “Cognitive Radio: Brain –Empowered Wireless Communications”, IEEE Journalon selected areas in communications, Feb 2005.
2. Hasari Celebi, Huseyin Arslan, “Enabling Location and Environment Awareness in CognitiveRadios”, Elsevier Computer Communications, Jan 2008.
3. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, “Software Defined Radio”, John Wiley, 2003.
4. Huseyin Arslan, “Cognitive Radio, SDR and Adaptive System”, Springer, 2007.
5. Alexander M. Wyglinski, Maziarnekovee, Thomas Hu Y., “Cognitive Radio Communication And Networks”, Elsevier, 2010.
6. Bruce A. Fette, “Cognitive Radio Technology”, Elsevier, 2009.
7. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, “Next generation / dynamic spectrum access / cognitive radio wireless networks: A Survey” ElsevierComputer Networks, May 2006

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	3	2
CO2	3	3	2	2	2	1						2	3	1	3	2
CO3	3	3	2	2	2	1	1					2	3	1	3	2
CO4	3	3	2	2	2	2						2	3	1	3	2
CO5	3	3	2	2	2	2	2					2	3	1	3	2
CO6	3	3	2	2	2	2	2					2	3	1	3	2

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

161ECE05	RFID AND ITS APPLICATIONS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem: -** **Category: PE**

AIM: This course aims to provide an overview of RFID AND ITS APPLICATIONS.

Course Outcomes: The students will be able to
CO1: Extend knowledge about the RFID fundamentals. (UN)
CO2: Explain the principles of RFID system. (UN)
CO3: Develop knowledge about the RFID system architecture. (AP)
CO4: Choose RFID standards. (AP)
CO5: Examine various transponders. (AN)
CO6: Develop RFID applications.(AP)

RF FUNDAMENTALS **9**

RF operating principle – Frequency divider –Coupling – Inductive coupling, Electromagnetic back scatter coupling, close coupling, Electrical coupling – Frequency ranges used in RF Coding- Digital Modulation – ASK,FSK,PSK.

RFID SYSTEM PRINCIPLES **9**

RFID systems – Component of an RFID System – Frequency, Range & Coupling – Transponder & Reader System – Equivalent Circuit – RFID Antennas: Antenna Parameters – Gain & directional effect, EIRP ERP, Input impedance, Effective aperture and scatter aperture Effective length Antenna types – Dipole antenn Yagi – Uda Antenna, Patch or micro strip antenna & slot antenna

RFID SYSTEM ARCHITECTURE **9**

Architecture of Transponder – HF interface, Address & Security logic, Memory architecture Microprocessors. Architecture of Reader - Components, Control Unit, Example – Reader IC U2270B, Connection of Antennas for inductive systems

RFID STANDARDIZATION AND MEMORY ORGANIZATION **9**

Animal Identification – ISO 11784 Code structure — ISO 11785 — Technical concept – Full/half duplex system - Sequential system – ISO 14223 — Advanced transponders – Air interface — Code and command structure - Read-only transponder - Writable transponder-Transponder with crypto logical function.

RFID APPLICATIONS **9**

Example Applications – Contact less Smart Cards, Public Transport, Ticketing, and Access control Transport Systems, Animal Identification. Electronic immobilization, Container Identification,Identificati Waste Disposal, Industrial Automation, Medical Applications.

TOTAL PERIODS45

TEXT BOOK

1. Finkenzeller.K, RFID Handbook: Fundamentals and Applications in contact less smart cards and identifications, John Wiley and sons Ltd, 2003

REFERENCES

1. Bill Glover and Himanshu Bhatt, RFID Essentials, Oreilly, 2006.
2. Patrick J.Sweeney II, RFID for Dummies, Wiley Publishing, Inc .
3. Sandip Lahiri, RFID Handbook, IBM, 2006.

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						2	2			2
CO2	3	3	2	3		1						2	2	2		2
CO3	2	2	3	2	1	1						2	2	2		2
CO4	3	2	2	2	1							2	2	2	1	2
CO5	3	2	2	3	1							2	2	2	1	2
CO6	3	2	2	2	1	1						2	2	2	1	2

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

161ECE06	SMART RADAR SYSTEMS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:** PE

AIM: To make the student understand the basic concepts of Radar and its applications in wireless smart systems

Course Outcomes: The students will be able to

CO1: Explain the basics of RADAR systems. (UN)
CO2: Demonstrate the detection of signals in noise and RADAR signals.(UN)
CO3: Analyze the characteristics of RADAR transmitter and receiver.(AN)
CO4: Illustrate the functions of RADAR Antenna. (UN)
CO6: Analyze the effect of errors on radiation patterns. (AN)
CO5: Interpret the operation of MTI and Pulse Doppler RADAR. (UN)

INTRODUCTION TO RADAR **9**

Basics of radar, EM Waves & properties- applications of radar, radar frequencies-radar block diagram, Radar Coordinates, Radar equation for hard targets and the SNR-radar cross section of targets, Radar Resolution Elements, Pulse, CW and FMCW Radars–configurations, transmitter power- pulse repetition frequency, Duty Ratio, Pulse Compression, Coding.

DETECTION OF SIGNALS IN NOISE AND RADAR SIGNALS **9**

Introduction to Noise in detail, probability density functions – probabilities of detection and false alarm-matched filter receiver-detection criteria – integration of radar pulses – constant-false alarm rate receivers – Radar Wave forms, Pulse Compression, Ambiguity Diagram.

RADAR TRANMIMTTER AND RECEIVER **9**

Introduction- Types of Transmitters – linear-beam power tubes- solid-state RF power sources- magnetron-Klystron, crossed-filed amplifier- radar receiver- receiver noise figure- super heterodyne receiver, Digital Receivers, duplexers and receiver protectors- radar displays-Human Machine Interface (HMI).

RADAR ANTENNA **9**

Functions of radar antenna- antenna parameters- antenna radiation pattern and aperture illumination – reflector antennas- electronically steered phased array antennas- phase shifters – frequency – scan arrays– architectures for phased arrays , radiators for phased arrays- mechanically steered planar array antennas-radiation pattern synthesis –effect of errors on radiation patterns – low side lobes antennas.

MTI AND PULSE DOPPLER RADAR **9**

Introduction to Doppler and MTI radar- delay –line cancellers- staggered pulse repetition frequencies-133oppler filter banks- digital MTI processing – Moving target detector- limitations to MTI performance-pulse Doppler radar-MTD, Tracking radar- monopulse tracking- conical scan and sequential lobing-comparison of trackers. Tracking accuracylow-angle tracking- Atmospheric & Weather Radars: Precipitation Radars, Doppler Weather Radar, Polarimetric Radar, Clear Air Radars.

TOTAL PERIODS **45**

TEXT BOOKS

1. Merrill I. Skolnik ," Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition) 2008.
2. Richard J Doviak and Dusan S Zrnic, "Doppler Radar and Weather Observations", Dover Publications,1993.

REFERENCES

1. Bringi V. N and Chandrasekar V, “Polarimetric Doppler Weather Radar “, Cambridge University Press,2001.
2. Richards M. A, Scheer J A and Holm W A, “Principles of Modern Radar”, Yes Dee Publishing Pvt. Ltd., 2012.

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)

161ECE07	SPEECH PROCESSING	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To understand different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes: The students will be able to

CO1: Explain the fundamentals of speech. (UN)
CO2: Illustrate the production and classification of speech sounds. (UN)
CO3: Build speech model. (AP)
CO4: Interpret speech recognition system. (UN)
CO5: Build speech recognition system. (AP)
CO6: Apply different speech synthesis techniques. (AP)

BASIC CONCEPTS

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds;Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts;Short-Time Fourier Transform, Filter-Bank and LPC Methods.

SPEECH ANALYSIS

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures– mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted CepstralDistances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale,LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping,Multiple Time – Alignment Paths.

SPEECH MODELING

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – ViterbiSearch, Baum-Welch Parameter Re-estimation, and Implementation issues.

SPEECH RECOGNITION

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-wordunits; Applications and present status.

SPEECH SYNTHESIS

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS,intelligibility and naturalness – role of prosody, Applications and present status.

TOTAL PERIODS 45

TEXT BOOKS

1. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education, 2002.

REFERENCES

1. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing, 1997.
2. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education, 2004.
3. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
4. Ben Gold and Nelson Morgan, “Speech and Audio Signal Processing, Processing and Perception of Speech and Music”, Wiley- India Edition, 2006.
5. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press, 1997.

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	3		3	
CO2	3	2	2	2								2	3		3	
CO3	3	3	2	2	2							2	3		2	
CO4	3	2	3	2	2							2	3		3	
CO5	3	3	2	2	2							2	3		3	
CO6	3	2	3	2	2							2	3		3	

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

161ECE11 ENERGY AWARE COMPUTING L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** **PE**

AIM: The aim of the course is to exposure the concepts of energy aware computing techniques.

Course Outcomes: The Students will be able to

CO1: Outline the Energy efficientnetwork on chip architecture. (UN)
CO2:Analyse the efficiency of energy saving in Disk storage systems.(AN)
CO3: Demonstrate the concepts of energy saving techniques.(UN)
CO4: Identify the various energy aware algorithms.(AP)
CO5: Illustrate the real time system using energy aware computing.(UN)
CO6: Classify the Energy aware applications. (UN)

INTRODUCTION **9**

Energy efficient network on chip architecture for multi core system-Energy efficient MIPS CPU core with fine grained run time power gating – Low power design of Emerging memory technologies.

ENERGY EFFICIENT STORAGE **9**

Disk Energy Management-Power efficient strategies for storage system-Dynamic thermal management for high performance storage systems-Energy saving technique for Disk storage systems.

ENERGY EFFICIENT ALGORITHM **9**

Scheduling of Parallel Tasks – Task level Dynamic voltage scaling – Speed Scaling – Processor optimization- Memetic Algorithms – Online job scheduling Algorithms.

REAL TIME SYSTEMS **9**

Multi-processor system – Real Time tasks- Energy Minimization – Energy aware scheduling- Dynamic Reconfiguration- Adaptive power management-Energy Harvesting Embedded system.

ENERGY AWARE APPLICATIONS **9**

On chip network – Video codec Design – Surveillance camera- Low power mobile storage.

TOTAL PERIODS 45

TEXT BOOK

1. Ishfaq Ah mad, Sanjay Ranka, Handbook of Energy Aware and Green Computing, Chapman and Hall/CRC, 2012.

REFERENCES

1. Chong-Min Kyung, Sungioo yoo, Energy Aware system design Algorithms and Architecture, Springer, 2011.
2. Bob steiger wald , Chris:Luero, Energy Aware computing, Intel Press, 2012.
3. Kevin Curran, Recent Advances in Ambient Intelligence and Context-Aware Computing, IGI Global, 2015.
4. Naima Kaabouch, Wen-Chen Hu, Energy- Aware Systems and Networking for Sustainable Initiaitives, IGI-Global, 2012.

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		3
CO2	3	3	2	2	2							2	2	2		3
CO3	3	2	2	2	2							2	2	2		3
CO4	3	2	2	3	2	1						2	2	2		3
CO5	2	2	2	2	2	2						2	2	2		3
CO6	3	3	3	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)

161ECE12 INDUSTRIAL INTERNET OF THINGS DESIGN L T P C
3 0 0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: The aim of the course is to make the students design and implement IOT in real time applications.

Course Outcomes: The students will be able to
CO1: Identify the components of IOT.(AP)
CO2: Design a portable IOT using appropriate boards.(AP)
CO3: Program the sensors and controller as part of IOT.(AN)
CO4: Develop schemes for the applications of IOT in real time scenarios.(AP)
CO5: Manage the Internet Resources.(UN)
CO6: Develop web of things from internet of things. (AP)

INTRODUCTION 9

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security –privacy. Components in internet of things: Control Units – Sensors – Communication modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication

PROGRAMMING THE MICROCONTROLLER FOR IOT 9

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/ Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors Communication: Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using wifi / Ethernet

RESOURCE MANAGEMENT IN THE INTERNET OF THINGS 9

Clustering – software Agents – Data Synchronization – Clustering Principles in an Internet of Things Architecture – The Role of Context – Design Guidelines –Software Agents for object – Data Synchronization – Types of Network Architectures – fundamental concepts of Agility and Autonomy –Enabling Autonomy and agility by the Internet of Things

BUSINESS MODELS FOR THE INTERNET OF THINGS 9

The Meaning of DiY in the Network Society – Sensor actuator Technologies and Middleware as as Basis for DiY Service Creatuon Framework –Device Integration –Middleware Technologies Needed for DiY Internet of Things Semantic Interoperability as a Requirement for DiY creation –Ontology – value Creation in the Internet of Things – Application of Ontology Engineering in the Internet of Things –Semantic Web Ontology – the Interne of Things in Context of Eurudice – Buisness Impact

FROM THE INTERNET OF THINGS TO THE WEB OF THINGS 9

Resource-oriented Architecture and Best Practices-Designing REST ful Smart Things –Web – enabling Constrained Devices – The Future Web of Things –Set up Cloud environment - Send data from microcontroller to cloud – Case Studies – Open Source e- Health sensor platform –Be Close Elderly monitoring – other recent projects

TOTAL PERIODS 45

TEXT BOOKS

1.Charalampos Doukas, Building Internet of Things with the Arduino, Create Space, April 2002.
2.Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011.

REFERENCE

1.Cuno Pfister, "Getting Started with the Internet of Things", O'Reilly, 2011.

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		3
CO2	3	3	2	2	2	2						2		2		3
CO3	3	2	2	2	3							2		2		3
CO4	2	2	2	2	2	2						2	2		2	3
CO5	2	2	2	2							2	2	2	2	1	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)

161ECE13 ELECTRONIC PRODUCT DESIGN L-T-P C

3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category** PE

AIM: To allow the students to acquire knowledge in PCB design, fabrication and EMI reduction techniques

Course Outcomes: The students will be able to

CO1: Explain manufacturing design process.(US)
CO2: Analyse PCB design rules for various electronic circuits.(AN)
CO3: Make use of EMI reduction techniques.(AP)
CO4: Demonstrate electronic systems packaging.(UN)
CO5: Compare various approaches in electronic product design.(UN)
CO6: Identify the issues in electronic product design.(AP)

MANUFACTURING PROCESS &INTERCONNECTION TECHNIQUES 9

Design Overview, Design Process, Product Design Methodology, Anatomy of Design Process and Translation of product concepts to manufacturing process, Elements of Interconnection, Wires, Cables, Connectors, Termination Methods. Maintainability and Serviceability Considerations, Electrical, Mechanical and other Aspects.

PCB DESIGN & FABRICATION 9

Overview of PCB Design, Guidelines, General Considerations for PCB Layout, Artwork, Photo Printing, Screen Printing, Plating, Etching, Soldering and Assembly Techniques, Emerging PCB Technology Trends, Overview of Design rules for Analog circuit PCB, Digital circuit PCB, Power circuit PCB, Application of Heat Sink concepts.

ELECTRO MAGNETIC INTERFERENCE (EMI) REDUCTION TECHNIQUES 9

Occurrence of EMI, Electromagnetic Compatibility (EMC), Safety Ground, Grounding Schemes, Differences between Analog and Digital Ground, Shielding Techniques, Line Impedance Stabilization, Network (LISN), Conducted Noises,Common Mode Noises (CM), Differential Mode Noises (DM), EMI filter Design.

OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING

System and history of semiconductors, Products and levels of packaging, handheld products, PWB, Semiconductor and Process flowchart, Wafer fabrication, Wafer packaging; Inspection and testing, Packaging evolution; Chip connection choices, Wire bonding, TAB and flip chip.

ELECTRONIC PRODUCT DESIGN 9

Overview of Electronic Product Design, Top-Down and Bottom-Up Approach, Considering Power Supply Design as an example, Ergonomic and Aesthetics Definition with Example, issues in Designing Electronic Products, Design of Controls and Display.

TOTAL PERIODS 45

TEXT BOOKS

1. Walter C Bosschard, “PCB design & Technology”, McGraw Hill, New Delhi.
2. Ronald A. Reis, “Electronic Project Design and Fabrication”, Prentice Hall.

REFERENCES

1.Harper, “Handbook of Electronic Packaging”, Mc Graw Hill, New York 1979.
2.R. S. Khandpur, “Printed Circuit Boards: Design, Fabrication, Assembly and Testing”, Tata Mc Graw Hill Book Co

3.Tim Williams, EMC for Product Designers, 4th ed.-Newnes.
4.V.S.Bagad, "Electronic Product Design", Technical Publications.

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	3		2
CO2	2	3	2	2	2							2	3	3		2
CO3	2	2	2	2	2	1	2					2	2	3	3	2
CO4	3	2	3	3	2							2	2	3		2
CO5	3	3	2	2	2		2					2	3	3		2
CO6	3	3	2	2	2	1	1					2	2	3		2

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

161ECE15	LOW POWER VLSI	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem: -** **Category: PE**

AIM: This course introduces advanced topics in VLSI circuit and system design. High-performance and low-power design issues in modern and future processes are discussed in detail.

Course Outcomes: The students will be able to

CO1: Determine the basics techniques in low power design.(AP)
CO2: Understand the advanced techniques in low power design which is a hot topic in today's market where the power plays major role.(UN)
CO3: Illustrate the power analysis and estimation process by using the spice simulator.(US)
CO4: Design the low power CMOS circuits.(CR)
CO5: Analyze the various low power architecture and systems.(AN)
CO6: Explain the software design for low power.(UN)

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,Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

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.

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.

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 .

SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER **9**

Synthesis for Low power – Behavioral level transforms- Software design for low power.

TOTAL PERIODS 45

TEXT BOOKS

1. K.Roy and S.C. Prasad ,"Low Power CMOS VLSI Circuit Design", Wiley,2000.
2. DimitriosSoudris, ChirstianPignet, Costas Goutis, "Designing CMOS Circuits for Low Power", Kluwer,2002

REFERENCES

1. J.B. Kuo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley,2001
2. Chandrakasan, R. Brodersen , "CMOS Low Power Digital Design", Kluwer Academic Publications. 2002.

3. AbdellatifBellaouar,Mohamed.I. Elmasry, "Low power digital VLSI design", Kluwer, 2000.
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. 2001.

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)

161ECE18	**WEARABLE ELECTRONICS**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To provide an overview of wearable electronics

Course Outcomes: The students will be able to

CO1: Classify the wearable electronics technology. (UN)
CO2: Identify the wearable electronics materials.(AP)
CO3: Explain the methods of wearable sheet type and manufacturing. (UN)
CO4: Develop the Flexible display circuits. (AP)
CO5: Infer the wearable electronics fabrication process. (UN)
CO6: Build the various wearable electronics applications. (AP)

OVERVIEW WEARABLE ELECTRONICS TECHNOLOGY **9**

History of Flexible Electronics - Materials for Flexible Electronics - Degrees of Flexibility – Substrates Backplane Electronic – Front plane Technologies – Encapsulation - Fabrication Technology for Flexible Electronics - Fabrication on Sheets by Batch Processing - Fabrication on Web by Roll-to-Roll Processing - Additive Printing.

WEARABLE ELECTRONICS MATERIALS **9**

Introduction of Materials Considerations for Flexible Electronics - Overview - Inorganic Semiconductors and Dielectrics - Organic Semiconductors and Dielectrics – Conductors- materials issue Issues of organic photovoltaicbasic operation -photocurrent - dark current.

WEARABLE SHEET TYPE **9**

Introduction - Sheet-type Image Scanners - Methods - Device Structure and Manufacturing Process Electronic Performance of Organic Photodiodes Organic Transistors Photo sensor Cells Issues Related to Device Processes: Pixel Stability and Resolution A Hierarchal Approach for Slow Organic Circuits The Double-Wordline and Double-Bitline Structure - A New Dynamic Second-Wordline Decoder Higher Speed Operation with Lower Power Consumption - Sheet Type Braille Displays - Manufacturing Process Electronic Performance of Braille Cells .

FLEXIBLE DISPLAY AND CIRCUITS **9**

Introduction - Enabling Technologies for Flexible Backplanes and Flexible Substrate Technologies TFT Technologies for Flexible Backplanes Display Media for Flexible Displays (LCD, reflective-EP, OLED) Barrier Layers - Important Organic TFT Parameters for Electronic Systems Field-Effect Mobility - Threshold Voltage - Leakage Currents - Liquid Crystal and Electrophoretic Displays Active Matrix OLED .

APPLICATION OF WEARABLE NEARABLE **9**

Photovoltaic cells – Solar cells - Photo sensor Cells - lithography - LED –LCD - OLED- Active Matrix OLED.

TOTAL PERIODS **45**

TEXT BOOK

1. Alberto Salleo and William S. Wong, “Flexible Electronics Materials and Applications”, Springer, 2009.

REFERENCES

1. Mario Caironi and Yong-Young Noh, “Large Area and Flexible Electronics“, Wiley, 2015.
2. Guozhen Shen, “Flexible Electronics from materials to devices”, World Scientific,2015.

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
CO2	3	3	2	2	2							2		3		2
CO3	3	3	3	3	2							2		3		2
CO4	3	3	2	2	2	1						2		3		2
CO5	3	3	2	2	2	2						2		3		2
CO6	3	3	3	2	2							2		3		2

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

161ECE19	MEMS AND NEMS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category: PE**

AIM: The aim of the course is to exposure the concepts of Micro and Nano Electromechanical systems.

Course Outcomes: The students will be able to

CO1: Explain MEMS sensor working principles with their fabrication. (UN)
CO2: Apply the mechanical characteristics and mechanical design.(AP)
CO3: Illustrate the electro static design of MEMS sensors. (UN)
CO4: Demonstrate the modeling of MEMS sensor and actuator. (UN)
CO5: Analyze the MEMS problems and software design. (AN)
CO6: Build the Optical and RF MEMS systems (AP)

INTRODUCTION TO MEMS AND NEMS **9**

Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Materials for MEMS and NEMS: Silicon, silicon compounds, polymers, metals.

MEMS FABRICATION TECHNOLOGIES **9**

Photolithography, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching techniques, Micromachining: Bulk Micromachining, Surface Micromachining, LIGA.

MICRO SENSORS **9**

MEMS Sensors: Design of Acoustic wave sensors, Vibratory gyroscope, Capacitive Pressure sensors, Case study: Piezoelectric energy harvester

MICRO ACTUATORS **9**

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces, Case Study:RF Switch.

NANO DEVICES **9**

Atomic Structures and Quantum Mechanics, Shrodinger Equation, ZnO nanorods based NEMS device: Gas sensor.

TOTAL PERIODS 45

TEXT BOOK

1.Stephen Santuria," Microsystems Design", Kluwer publishers, 2006.

REFERENCES

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. Sergey Edward Lyshevski, ―MEMS and NEMS: Systems, Devices, and Structures‖ CRC Press, 2002
4. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	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)

161ECE20	AGRICULTURE ELECTRONICS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To develop an electronicsplatform for agriculture to raise the standards so that agriculture can be long lasting and competitive

Course Outcomes: The students will be able to

CO1: Explain the basics of agriculture. (US)
CO2: Demonstrate the functionality of transducers used in agriculture. (UN)
CO3: Illustrate the various meteorological instruments utilized in agriculture. (UN)
CO4: Apply the computer technologies in agriculture. (AP)
CO5: Summarize the concept of various information technologies in agriculture. (UN)
CO6: Analyze the functionality of microprocessor in agriculture applications. (AN)

BASICS OF AGRICULTURE **9**

Introduction to Soil Science- Soil structure, Soil properties, Soil processes, Formation of Soil, types of soils, Soil as a medium for plant growth, Soil moisture & efficiency, soil pH values, Chemical analysis of soil, water bearing capacity, Soil erosion and conservation, measurement of soil parameters. Basic principles and advances in photosynthesis. Role of fertilizers, Different types of crops eg. Floriculture, Horticulture

AGRICULTURE TRANSDUCERS **9**

Introduction - transducer-functions and 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.

INTRODUCTION TO AGRO METEOROLOGY **9**

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 - Automatic drip irrigation- Green House Instrumentation: Green House Technology introduction, instrumentation required for tissue culture techniques.

COMPUTERS AND 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.-imulators used for study of crop growth-Data logger, features of data loggers-data loggers for dedicated use in agriculture-Computer based automatic weather station.

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 Periods 45

TEXT BOOK

1. Krishna kant, "Microprocessor-Based Agri Instrumentation",1st edition, PHI, 2008

REFERENCES

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

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)

161ECE22 SMART STRUCTURES AND SMART MATERIALS L-T-P C

3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem: - Category** PE

AIM: To give an insight into the latest developments regarding smart materials and their use in structures.

Course Outcomes: The students will be able to

CO1: Classify the smart materials and sensing systems. (UN)
CO2: Explain the measurement techniques for the transducers. (UN)
CO3: Show the various measurements using sensors. (UN)
CO4: Build the actuation techniques. (AP)
CO5: Identify the role of actuators. (AP)
CO6: Explain the signal processing in control Systems. (AP)

INTRODUCTION 9

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

SENSORS 9

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

ACTUATORS 9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

TOTAL PERIODS 45

TEXT BOOK

1 Mel Schwartz,"Smart Materials", ,Tata McGraw-Hill 2008

REFERENCES

1 . L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 2000.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 2002.

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		2					2	2	2	2	3
CO2	3	2	3	2	2	1						2		3	2	3
CO3	3	3	3	2	2							2		2		2
CO4	3	2	3	2	2							2		2		3
CO5	3	3	3	2	2	1						2		2		3
CO6	3	3	3	2	2	1						2	2	2	3	3

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

161ECE23	CYBER SECURITY	L	T	P	C
		3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:**PE

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 Outcomes: The students will be able to

CO1: Clarify the concepts of cybercrime.(UN)
CO2: Outline the various issues of cybercrime.(UN)
CO3: Summarize the methods and tools of cyber crime investigation.(UN)
CO4: Develop the procedures of digital and network forensics.(AP)
CO5: Analyze Iris and Fingerprint Recognition.(AN)
CO6: Estimate various laws and regulation dealing with cyber crime and digital forensics.(AP)

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.

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.

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.

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.

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 PERIODS 45

TEXT BOOK

1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

REFERENCES

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw –Hill, New Delhi, 2006.
2. Robert M Slade," Software Forensics", Tata McGraw – Hill, New Delhi, 2005.
3. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004."Understanding Forensics in IT", NIIT Ltd, 2005.

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	2			1
CO2	3	2	2	2	2	1	2	2			2	2	2			1
CO3	3	2	2	2	2	2		2			2	2	3		3	2
CO4	3	2	2	2	2	2		2			2	2	3		3	2
CO5	3	2	2	2	2	2		2			2	2	3		3	2
CO6	3	2	2	2	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)

161ECE24 CRYPTOGRAPHY AND NETWORK SECURITY L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: Describe the principles of public key cryptosystems, hash functions and digital signature.

Course Outcomes: The students will be able to

CO1: Summarize the concept of number theory.(UN)
CO2:Analyze block ciphers and public key cryptography.(AN)
CO3: Illustrate hash functions and digital signatures.(UN)
CO4: Examine security practice and system security.(AN)
CO5: Classify the types of firewalls.(UN)
CO6:Apply the tools and techniques of quality management to manufacturing and services processes.(AP)

INTRODUCTION & NUMBER THEORY 9

Services, Mechanisms and attacks-the OSI security architecture-Network security model-ClassicalEncryption techniques (Symmetric cipher model, substitution techniques, transposition techniques,steganography).Finite fields and number theory: Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat's and Euler's theorem-Testing for primality –The Chinese remainder theorem- Discrete logarithms.

BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 9

Data Encryption Standard-Block cipher principles-block cipher modes of operation-AdvancedEncryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principlesof public key cryptosystems-The RSA algorithm-Key management – Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

HASH FUNCTIONS AND DIGITAL SIGNATURES 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hashfunction and MAC –MD5 – SHA – HMAC – CMAC – Digital signature and authentication protocols –DSS – EI Gamal – Schnorr.

SECURITY PRACTICE & SYSTEM SECURITY 9

Authentication applications – Kerberos – X.509 Authentication services – Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls – Firewall designs – SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

E-MAIL, IP & WEB SECURITY9

E-mail Security: Security Services for E-mail-attacks possible through E-mail – establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec – IP and Ipv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

TOTAL PERIODS 45

TEXT BOOK

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013. (,II,III,IV).

REFERENCES

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", WileyPublications, 2003.
3. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
4. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
5. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India,2002.

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								3	3			3
CO2	3	3	3	2	2							2	3			2
CO3	3	3	3	2	3				2			2	3		2	2
CO4	3	2	3	3	2	2			2			2	3		3	2
CO5	3	3	2	3	2				2			2	3			2
CO6	3	3	2	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)

161ECE26 COMPUTER ARCHITECTURE AND ORGANIZATION L T P C
3 0 0 3

Programme: B.E. Electronics and Communication Engineering **Sem:-** Category:PE

AIM: To study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

Course Outcomes

CO1: Demonstrate the number representation. (UN)
CO2: Illustrate the datapath design. (UN)
CO3: Classify control design. (AY)
CO4: Construct the memory organisation. (AP)
CO5: Explain the communication methods. (UN)
CO6: Interpret the advanced architectural features . (UN)

INTRODUCTION 9

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

DATA PATH DESIGN 9

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

CONTROL DESIGN 9

Hardwired Control, Micro programmed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

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.

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 PERIODS 45

TEXT BOOKS

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, 3rd edition, 2008.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "ComputerOrganisation", 5th edition, McGraw-Hill Inc, 2000.

REFERENCES

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 ofIndia, 2007.
4. G.Kane & J.Heinrich, 'MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall, 2000.

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		2
CO2	3	2	2	2	2	2						2	2	2		2
CO3	3	3	2	2	2	2				1		2	2	2		2
CO4	3	2	2	2	2	2						3	2	2		2
CO5	2	2	3	2	2							2	2	2		2
CO6	2	2	2	2	2	2						1	2	2		2

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

161ECE27 CLOUD COMPUTING L-T-P C
3-0-0 3

Programme: B.E. –Electronics and Communication Engineering **Sem: - Category: PE**

AIM: To impart fundamental concepts in the area of cloud computing & its applications

Course Outcomes:

The Students will be able to
CO1: Explain the fundamental concept of Cloud Computing. (UN)
CO2: Identify the various cloud enable technologies.(AP)
CO3: Explain the cloud computing mechanisms.(UN)
CO4: Analyze the different types of cloud architectures and models.(AN)
CO5: Inference the security issues in the grid and the cloud environment.. (UN)
CO6: Identify the clouds in consumer perspective and cloud provider perspective. (AP)

FUNDAMENTAL CLOUD COMPUTING 9

Origins and Influences - Basic Concepts and Terminology - Goals and Benefits - Risks and Challenges - Fundamental Concepts and Models - Roles and Boundaries - Cloud Characteristics - Cloud Delivery Models - Cloud Deployment Models.

CLOUD-ENABLING TECHNOLOGY 9

Broadband Networks and Internet Architecture- Data Center Technology- Virtualization Technology - Web Technology -Multitenant Technology -Service Technology -Case Study Example - Cloud Security Threats.

CLOUD COMPUTING MECHANISMS 9

Cloud Infrastructure Mechanisms- Logical Network Perimeter Virtual Server - Cloud Storage Device Cloud Usage Monitor -Resource Replication Ready-Made Environment Cloud Management -Mechanisms Remote Administration System- Resource Management System -SLA Management System -Billing Management System.

CLOUD COMPUTING ARCHITECTURE 9

Fundamental Cloud Architectures Workload Distribution Architecture- Resource Pooling Architecture- Dynamic Scalability Architecture- Elastic Resource Capacity Architecture- Service Load Balancing Architecture- Cloud Bursting Architecture- Elastic Disk Provisioning Architecture- Redundant Storage Architecture - Advanced Cloud Architectures- Hypervisor Clustering Architecture- Load Balanced Virtual Server Instances Architecture- Non-Disruptive Service Relocation Architecture- Case Study Example.

WORKING WITH CLOUDS 9

Cloud Delivery Models: The Cloud Provider Perspective - The Cloud Consumer Perspective- Cost Metrics and Pricing Models- Business Cost Metrics -Cloud Usage Cost Metrics- Cost Management Considerations.

TOTAL PERIODS 45

TEXT BOOK

1.Thomas Erl, Zaigham Mahmood, Ricardo Puttini , “Cloud Computing: Concepts, Technology & Architecture” Prentice Hall/Pearson PTR , 2013.

REFERENCES

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Kumar Saurabh, "Cloud Computing – Insights into New Era Infrastructure", Wiley Indian Edition, 2011.
3. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

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							2	2			
CO2	3	2	2	2	2							2	2			
CO3	3	3	2	2	2	1						2	2			
CO4	3	2	2	2	2							2	2			
CO5	2	2	3	2	2							2	2			2
CO6	2	2	2	2	2	1	2	2				2	2			2

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

161ECE29 MULTI-CORE PROGRAMMING L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category** **PE**

AIM: To expose the students to the basic concepts of Multi Core programming and various practical models of Multi Core programming.

Course Outcomes: The Students will be able to
CO1: Summarize the concept of Multicore architecture. (UN)
CO2: Explain multi-core processors software development products. (UN)
CO3: Illustrate debugging techniques of Threading APIs. (UN)
CO4: Examine various Multi-core processors.(AN)
CO5: Analyze the general debugging techniques.(AN)
CO6: Develop Multi Core Processors efficiently using programming tools. (AP)

INTRODUCTION TO MULTI-CORE ARCHITECTURE **9**

Motivation for Concurrency in Software, Parallel Computing Platforms(SIMD & MIMD systems, an overview of Single-Core, Multi-Processor,Multi-Core Architectures) , Parallel Computing in Microprocessors,Differentiating Multi-Core Architectures from Hyper-Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms,Understanding Performance, Amdahl's Law, Gustafson's Law

MULTI-CORE PROCESSORS **9**

An Overview of Software Threading Defining Threads, System Viewof Threads: Threading above the Operating System, Threads inside theOS , Threads inside the Hardware , Application Programming Modelsand Threading ,Virtual Environment: Virtual Machines and Platforms, Runtime Virtualization, System Virtualization.Designing for threads, parallel programming patterns, Threading and parallel programming constructs: Synchronization, Critical sections,Deadlock, Synchronization Primitives, and Messages

THREADING API'S **9**

Threading APIs for Microsoft Windows, Threading APIs for Microsoft.NET Framework: Creating Threads, Managing Threads, Thread Pools,Thread Synchronization, POSIX Threads: Creating Threads, ManagingThreads, Thread Synchronization , Signaling , Compilation and Linking

OPENMP PROGRAMMING **9**

Open MP Challenges in Threading a loop, Minimizing Threading overhead,Performance oriented Programming ,Library Functions. Solutions toparallel programming problems: Data races, deadlocks and LivelocksNon-blocking algorithms, Memory and cache related issues.Message-Passing Model, Message-Passing Interface, MPI functions,Compiling and running MPI Programs, collective communication, data decomposition, Point-to-point communication – MPI Library.

MULTI-THREADED DEBUGGING TECHNIQUES: **9**

General Debug Techniques, Debugging Multi-threaded Applications inWindows: Threads Window, Trace points, Breakpoint Filters, NamingThreads, Multi-threaded Debugging Using GDB.

TOTAL PERIODS 45

TEXT BOOK

1. Shameem Akhter and Jason Roberts, "Multi-coreProgramming- Increasing Performance through SoftwareMulti-Threading", 1st Edition, Intel Press, 2006.

REFERENCES

1. Michael J Quinn, "Parallel programming in C with MPI andOpenMP", 2ndEdition, Tata McGraw Hill, 2007.
2. John L.Hennessey and David A.Patterson, "Computer architecture – A quantitative approach", 4thEdition, MorganKaufmann Elsevier Publishers, 2007.
3. David E. Culler, Jaswinder Pal Singh, "Parallel computingarchitecture: A hardware software approach", 1stEdition,Morgan Kaufmann Elsevier Publishers, 1999.

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								2				3
CO2	3	2	2	2	1							2				3
CO3	3	2	2	2	2	1						2				3
CO4	3	2	2	2	2							2	2		2	3
CO5	3	2	2	2	2							2				3
CO6	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)

161ECE30	QUANTUM COMPUTING	L-T-P	C
		3-0-0	3

Programme: B.E – Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To study various quantum algorithms and error correcting codes

Course Outcomes: The Students will be able to

CO1: Illustrate the basics of quantum. (UN)
CO2: Explain the operation of quantum gates and circuits.(UN)
CO3: Summarize quantum algorithms. (UN)
CO4: Examine quantum communication and its complexity. (AN)
CO5: Develop quantum error correcting codes. (AP)
CO6: Analyze quantum key generation and cryptographic protocols. (AN)

QUANTUM BASICS 9

Introduction, Axioms of Quantum mechanics, quantum states andnotation, unitaries, quantum bit (qubit), measurements, quantum gates, classicalreversible circuits, quantum circuits, universality

QUANTUM ALGORITHMS 9

Teleportation,Deutsch's algorithm, Simon's algorithm, Hidden subgroup problems, Quantum Fourier transform, Shor's algorithm for factoring, Grover's algorithm

QUANTUM COMMUNICATION 9

Definition of models, Equality, Disjointness with quantum communication, Simultaneous message passing and finger prints, quantum communication complexity

QUANTUM ERROR CORRECTING CODES 9

Quantum dynamics and decoherence, Error Correction, Shor's nine-qubit error correcting code, A seven – qubit quantum error correcting code, A five-qubit error – correcting code, Stabilizers and the five-qubit code, theoretical aspects of stabilizer codes, CSS codes, Abstract quantum error correction

QUANTUM CRYPTOGRAPHY 9

Quantum Key generation, Quantum cryptographic protocols, quantum teleportation and superdense coding

TEXT BOOK

1. Jozef Gruska," Quantum Computing",Mc Graw Hill,2005

REFERENCES

1. M. A. Nielson and I. L. Chuang, "Quantum Computation and QuantumInformation", Cambr. Univ. Press, 2000.
2. A. Yu. Kitaev, A.H. Shen, M.N. Vyalyi, "Classical and Quantum Computation",Amer. Mathematical Society, 2002.
3. R. de Wolf, "Quantum Communication and Complexity", Theoretical ComputerScience,2002.
4.Arthur O.Pittenger,"An Introduction to Quantum Computing Algorithms", progress in computer science and applied logic; vol.19 ISBN 0-8176-4127-0

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	2	2	2	2							2	2	3		2
CO3	3	2	2	3	2							2	2	3		2
CO4	3	3	2	2	2							2	2	3		2
CO5	3	2	2	2	2							2	2	3		2
CO6	3	3	2	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)

OPEN ELECTIVES

161OE201 BIO MEDICAL INSTRUMENTATION L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** OE

AIM: To make students to understand the applications of electronics in diagnostic and therapeutic area.

Course Outcomes: The Students will be able to

CO1: Demonstrate different bio potentials and their recording methods. (UN)
CO2: Explain measurements of biochemical & nonelectrical parameters. (UN)
CO3: Examine the working of Heart assist devices. (AN)
CO4: Develop biotelemetry system. (AP)
CO5: Apply modern imaging systems in the medical field. (AP)
CO6: Extend recent trends in biomedical instrumentation.(UN)

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.

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.

ASSIST DEVICES AND BIO-TELEMETRY 9

Cardiac pacemakers, Cardiac Defibrillators, Wireless telemetry, single channel telemetry systems, Multichannel telemetry systems, Implantable Telemetry Systems, Telemedicine

MODERN IMAGING SYSTEMS 9

X-ray Machines and Digital radiography, X ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System

RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Laser applications in biomedical field, Physiotherapy and Electrotherapy equipment, Electrical safety in medical equipment.

TOTAL PERIODS 45

TEXT BOOK

1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, NewDelhi, 2010.

REFERENCES

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”, John Wiley and Sons, New York, 2004.

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)

161OE202	DIGITAL IMAGE PROCESSING	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** OE

AIM: To learn digital image fundamentals and familiar with image compression and segmentation techniques

Course Outcomes: The Students will be able to
CO1: Summarize the digital image fundamentals.(UN)
CO2: Demonstrate the image enhancement techniques. (UN)
CO3: Develop the image restoration model. (AP)
CO4: Explain the methods of image segmentation. (UN)
CO5: Analyze compression techniques and the standards. (AN)
CO6: Illustrate image representation and recognition techniques. (UN)

DIGITAL IMAGE FUNDAMENTALS **9**

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

IMAGE ENHANCEMENT **9**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

IMAGE RESTORATION AND SEGMENTATION **9**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filteringSegmentation:Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation.

WAVELETS AND IMAGE COMPRESSION **9**

Wavelets – Subband coding - Multiresolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

IMAGE REPRESENTATION AND RECOGNITION **9**

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL PERIODS 45

TEXT BOOKS

1.Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.
2.Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Willliam K Pratt, “Digital Image Processing”, John Willey, 2002.
3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI LearningPvt. Ltd., 2011.
4. http://eeweb.poly.edu/~onur/lectures/lectures.html.
5. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

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)

161OE203 CONSUMER ELECTRONICS L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem: - Category: OE**

AIM: To provide an overview of domestic entertainment electronics.

Course Outcomes: The Students will be able to

CO1: Classify different types of loudspeaker and microphones.(UN)
CO2: Analyze the magnetic recording and reproduction mechanism.(AN)
CO3: Acquire knowledge about processing and reconstruction of audio and video signals.(UN)
CO4: Demonstrate the components of the television system.(UN)
CO5: Examine the various colour television systems.(AN)
CO6: Analyze the working principlesof home appliances.(AN)

LOUDSPEAKERS AND MICROPHONES 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

MAGNETIC RECORDING AND REPRODUCTION 9

Magnetic recording and playback – magnetic erasing – recording medium – cassettes – tape speeds – MUF – Track Configuration – Tape transport mechanism – mechanical and electronic controls – TAPE Vs Disc

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.

TELEVISION STANDARDAND 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, HDTV

HOME APPLIANCES 9

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL PERIODS 45

TEXT BOOKS

1. S.P.Bali, “Consumer Electronics”, Pearson Education,4th impression, 2011.
2. B.R.Gupta, “Consumer Electronics”, S.K.Kataria&Sons, 2011

REFERENCES

1. R.G.Gupta, “Audio and Video Systems”, Tata McGraw Hill, 2010.
2. K. Blair, Benson “Audio Engineering Hand book”, 2001
3. R.R Gulati, “Complete Satellite & Cable Television”, New age International Publisher, 2008
4. Philip Hoff, ”Consumer Electronics for Engineers”, Cambridge University Press ISBN 9780521582070, 1998

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							2	2	3	2	3
CO2	3	3	3	2	2	2						2	2	3	2	3
CO3	3	2	2	2	1	1						2		3	3	
CO4	3	2	2	2								2	2	3		
CO5	3	2	2	2	1	2						2	2	3	2	2
CO6	3	2	2	2	2	2						2		3	2	3

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

161OE204 MULTIMEDIA COMPRESSION AND COMMUNICATION L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category** PE

AIM: To introduce the concepts of multimedia communication.

Course Outcomes: The Students will be able to
CO1: Explain the components of multimedia communication. (UN)
CO2: Interpret the various audio, video compression standards.(UN)
CO3: Develop the text and image compression coding techniques. (AP)
CO4: Apply VOIP technology.(AP)
CO5: Classify the multimedia networking services. (UN)
CO6: Compare the multimedia communication protocols. (UN)

MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

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.

TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compressionentropy encoding –source encoding -text compression –static Huffman coding– arithmetic coding –Lempel ziv-welsh Compression-image compression

VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols,Call establishment and release, Quality of Service- CODEC Methods- VOIP applicability

MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making the best Effort serviceprotocols for real time interactive Applications-distributing multimedia-beyond best effort servicescheduling and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL PERIODS 45

TEXT BOOKS

1. Fred Halshall “Multimedia communication - Applications, Networks, Protocols and Standards”,Pearson Education, 2007.
2. Kurose and W.Ross “Computer Networking “a Top Down Approach”, Pearson Education,2005

REFERENCES

1.Tay Vaughan, “Multimedia: Making it work”, 7th Edition, TMH 2008
2. Marcus Goncalves “Voice over IP Networks”, Mc Graw Hill 1999.
3. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007.
4. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education Ranjan Parekh, “Principles of Multimedia”, TMH 2007.

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	2
CO2	3	3	2	2								2	3		3	2
CO3	3	2	2	2	2	2						2	3		3	2
CO4	3	3	2	2	2			2				2	3		2	2
CO5	3	3	2	2	2							2	3	3	2	2
CO6	3	3	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)

161OE205 HIGH SPEED NETWORKS L-T-P C
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** **OE**

AIM: The aim of the course is to make the students able to identify the features of different technologies involved in High Speed Networking and their performance.

Course Outcomes: The Students will be able to

CO1: Discuss the current state of the art in the field of networking technology.(UN)
CO2: Describe how ATM technologies influence the design and implementation of computer networks.(UN)
CO3: Model the single server queues and understand the issues involved in congestion control and the concept of RF amplifier design.(AP)
CO4: Examine the TCP flow control mechanism and traffic control techniques in ATM network.(AN)
CO5: Justify the need for various integrated and differentiated services.(UN)
CO6: Identify the approaches that support the provision of QoS in Internet.(AP)

HIGH SPEED NETWORKS 9

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM 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.

CONGESTION AND TRAFFIC MANAGEMENT 9

Queuing Analysis - Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

TCP AND ATM CONGESTION CONTROL 9

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

INTEGRATED AND DIFFERENTIATED SERVICES 9

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

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 PERIODS45

TEXT BOOK

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

REFERENCES

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.

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)