ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

For CBCS BASED B.TECH – FOUR YEAR PROGRAM
(Applicable for the batches admitted from AY 2016-17)

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Pin Code: 501 301

ACADEMIC REGULATIONS 2016
For CBCS Based B.Tech. PROGRAMMES

(Effective for the students admitted into I year from the Academic Year **2016-17** and onwards)

1.0 Under-Graduate Degree Programme (B.Tech.) in Engineering

Geethanjali College of Engineering and Technology (GCET) offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2016 - 17 onwards, in the following Branches of Engineering

S. No.	***Branch***
I.	Civil Engineering
II.	Computer Science and Engineering
III.	Electrical and Electronics Engineering
IV.	Electronics and Communication Engineering
V.	Mechanical Engineering

2.0 Eligibility for Admission

2.1 Admission to the B.Tech. Programme shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (EAMCET), OR the JNTUH, OR on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.

2.2 The medium of instruction for all the B.Tech. programmes shall be ENGLISH only.

3.0 B.Tech. Programme Structure

3.1 The B.Tech. Programmes of GCET are of semester pattern, with 8 semesters constituting 4 academic years, each academic year having TWO semesters (first/odd and second/even semesters). Each semester shall be of 21 weeks duration (inclusive of examinations), with a minimum of 90 working days per semester.

3.2 UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:

Each B.Tech. program is of 4 (Four) academic years (8 semesters), with each academic year being divided into two semesters of 21 weeks (minimum of 90 working days) each, which includes instruction period, preparation and examinations period; each semester having - '**Continuous Internal Evaluation (CIE)**' and

'**Semester End Examination (SEE)**'. **Choice Based Credit System (CBCS)** and **Credit Based Semester System (CBSS)** as denoted by UGC, and curriculum/ programme structure as suggested by AICTE are followed.

3.2.2 Credit Courses:

All courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each course in a L: T: P/D: C (Lecture periods: Tutorial periods: Practicals / Drawing periods: Credits) Structure, based on the following general pattern ..

- One credit - for one hour/ week/ semester for Theory/ Lecture (L) courses;
- One credit - for two hours/ week/ semester for Laboratory/Practical (P) Courses or Drawing Periods (D).
- Two credits for three hours/ week/ semester for Laboratory/Practical (P) Courses or Drawing Periods (D).
- One credit for two hours / week /semester for activity oriented course "Logical reasoning".
- Other student activities (co-curricular and extra-curricular), namely, NCC, NSS, NSO, Study Tour, Guest Lecture etc. and identified Mandatory Courses, if any, shall not carry credits.

3.2.3 Course Classification:

All courses offered for the B.Tech. programme are broadly classified as: (a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (EℓC).

- Foundation Courses (FnC) are further categorized as : (i) HS (Humanities and Social Sciences), (ii) BS (Basic Sciences), and (iii) ES (Engineering Sciences);
- Core Courses (CoC) and Elective Courses (EℓC) are categorized as PS (Professional Courses), which are further subdivided as – (i) PC (Professional/ Departmental Core) Courses, (ii) SC (Soft Core Courses - professional courses which can be opted from the given list along with the associated lab component) (iii) PE (Professional/ Departmental Electives) , (iv) OE (Open Electives); and (v) Project Works (PW);
- Minor Courses (1 or 2 Credit Courses, belonging to HS/ BS/ ES/ PC as per relevance).
- Mandatory course(s) (MC – Non credit oriented)

4.0 Course Work for B.Tech. Programme

4.1 A student, after securing admission, shall pursue the B.Tech. programme in a minimum period of 4 academic years, and a maximum period of 8 academic years (starting from the date of commencement of I Year).

4.2 Each student shall register for and secure the specified number of credits required for the completion of the B.Tech. programme and award of the B.Tech. degree in respective branch of Engineering.

4.3 Each semester is structured to provide typically 24 Credits (24 C), totaling to 192 credits (192 C) for the entire B.Tech. programme.

5.0 Course Registration

5.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who shall advise him about the B.Tech. programme, its structure along with curriculum, choice/option for courses, based on his competence, progress, pre-requisites and interest.

5.2 A Student may be permitted to Register for Course of his CHOICE with a typical total of 24 Credits per Semester (Minimum being 20 C and Maximum being 28 C, permitted deviation being ± 17%), based on his PROGRESS and SGPA/ CGPA, and study of the 'PRE-REQUISITES' as indicated for various Courses, in the Department Course Structure and Syllabus contents. However, a MINIMUM of 20 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

5.3 Choice for 'additional courses' to reach the Maximum Permissible Limit of 28 Credits (above the typical 24 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor.

5.4 Academic section of the college invites 'Registration Forms' from students a priori (before the beginning of the semester). Registration requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

5.5 A student can apply for registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his faculty advisor, which should be submitted to the College Academic Committee through the Head of the Department (a copy of the same being retained with Head of the Department, Faculty Advisor and the student).

5.6 If the student submits ambiguous choices or multiple options or erroneous entries - during registration for the course(s) under a given/ specified course Group/ Category, namely, core elective with lab, professional elective and open elective as listed in the programme structure, Faculty Advisor shall rectify such errors and advise the student accordingly.

5.7 Course options exercised and approved by Faculty Advisor are final and CAN NOT be changed, and CANNOT be inter-changed; further, alternate choices shall also not be considered. However, if the course that has already been listed for registration (by the department) in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice - either for a new course (subject to offering of such a course), or for another existing course offered, which may be considered. Such alternate arrangements shall be made by the department, with due notification and time-

framed schedule, within the FIRST WEEK from the commencement of class-work for that semester.

5.8 For **Mandatory Courses** like NCC/ NSS/ NSO etc., a '**Satisfactory Participation Certificate'** from the concerned authorities for the relevant semester is essential. No Marks or Grades or Credits shall be awarded for these activities.

6.0 Courses to be offered

6.1 A typical section (or class) strength for each semester shall be 60.

6.2 An Elective Course may be offered to the students, ONLY IF a Minimum of 20 students (1/3 of the Section Strength) opt for the same. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

6.3 More than ONE INSTRUCTOR may offer the SAME COURSE (Lab./Practicals may be included with the corresponding Theory course in the same semester) in any semester.

6.4 If more entries for registration of a course come into picture then the Head of the Department concerned shall decide whether or not to offer such a course for two or multiple sections.

6.5 In case of options coming from students of other departments/ branches/ disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department'.

7 Attendance Requirements

7.1 A student shall be eligible to appear for the Semester End Examinations, if he acquires a minimum of 75% of attendance in lectures/tutorials/practicals/drawing/projects/seminars in aggregate of all the courses for that semester.

7.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on valid medical grounds, or participation in sports, games, NCC, NSS, other co-curricular and extra-curricular activities, recognized for the purpose, and the participation having prior approval of the competent authority. Such condonation shall be based on the student's representation with supporting evidence.

7.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

7.4 Shortage of attendance below 65% in aggregate shall in "**NO"** case be condoned.

7.5 Students, whose shortage of attendance is not condoned in any semester, are not eligible to take their Semester End Examinations and they get detained and their registration for

that semester shall stand cancelled. They shall not be promoted to the next semester. They may seek re-registration for all those courses registered in that semester in which they were detained, by seeking re-admission into that semester as and when offered. In the case of elective courses, namely, professional elective(s), soft-core with associated lab and / or open elective(s), the same may also be re-registered, if offered. However, if those elective(s) are not offered in later semesters, then alternate elective(s) may be chosen from the SAME set of elective course(s) offered under that specific category.

7.6 A student fulfilling the attendance requirements in the present semester shall not be eligible for readmission into the same class.

8 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Section No.**7.**

8.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if he secures not less than 35% marks (for e.g. 25 out of 70 marks in theory course) in the Semester End Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing Pass (C) Grade or above in that course.

8.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Industry oriented Mini-Project/ Seminar, if he secures not less than 40% of the total marks to be awarded for each. The student would be treated as failed, if he - (i) does not submit a report on his Industry Oriented Mini-Project, or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule, or (ii) does not present the Project Seminar as required in the IV year I Semester, or (iii) does not present the Technical Seminar as required in the IV year II Semester or (iv) secures less than 40% of marks in Industry oriented Mini-Project/ Seminar evaluations.
He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.3 Promotion Rules

8.3.1 Case (i): A student registers for 24 credits or more in each semester as per the provision in section 5.2

8.3.1.1 A student shall not be promoted from I Year to II Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 24 credits out of 48 credits or more the student has registered in first year, from all the relevant

regular and supplementary examinations, whether he takes those examinations or not.

8.3.1.2 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 58 credits out of 96 credits or more the student has registered up to and including II Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.1.3 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 86 credits out of 144 credits or more the student has registered up to and including III Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2 Case (ii): A student registers for NOT less than 20 credits and less than 24 credits in each Semester.

8.3.2.1 A student shall not be promoted from I Year to II Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 50% of the credits registered in first year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2.2 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including II year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2.3 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including III year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student shall register for all courses covering 192 credits as specified and listed (with the relevant courses as mentioned) in the Programme Structure, put up all the Attendance and Academic requirements for 192 Credits securing a minimum of C Grade (Pass Grade) or above in each course, and 'earn ALL 192 Credits securing SGPA $\geq$ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) $\geq$ 5.0, to successfully complete the B.Tech. Programme.

8.5 A student must secure the necessary 192 credits as specified for the successful completion of the entire B.Tech. programme (see section 12.1); however, only 186 credits shall be considered for evaluating his overall performance for the award of class as provided for under section 12.0. These 186 credits shall be arrived at by leaving out two courses (one from open elective courses and one from professional elective courses) carrying a total of 6 credits, which have the least Grade point scores.

8.6 Students who fail to earn 192 credits as per the Programme Structure, and as indicated above, within 8 academic years from the date of commencement of their I Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

8.7 A student detained due to shortage of attendance in any semester, may be re-admitted into that semester, as and when offered, with the Academic Regulations of the batch into which he gets readmitted. However, no grade allotments or SGPA/ CGPA calculations shall be done for the corresponding semester in which he got detained.

8.8 A student detained due to lack of credits in any year, may be readmitted in the next year, after fulfillment of the Academic Requirements, with the Academic Regulations of the batch into which he gets readmitted.

8.9 A student eligible to appear in the Semester End Examination in any course, but absent at it or failed (thereby failing to secure C Grade or above), may reappear for that course at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that course shall be carried over, and added to the marks obtained in the supplementary examination, for evaluating his performance in that course.

9 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each semester shall be evaluated course-wise (irrespective of credits assigned) with a maximum of 100 marks for all types of courses, namely, theory, drawing, practicals, seminar (Project, Technical), Major project, Industry Oriented Mini-Project, Comprehensive Viva-Voce, Minor Courses etc.

The evaluations are as follows:

- Theory, practical, drawing and major project courses shall be evaluated based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination),
- Technical seminar and Major project seminar shall be evaluated based on 100% CIE (Continuous Internal Evaluation)
- Industry Oriented mini-project and comprehensive Viva-Voce shall be evaluated based on 100% SEE (Semester End Examination)

A letter grade corresponding to the % marks obtained shall be given for all courses.

9.2 a)

i. For theory courses (inclusive of Minor Courses), during the semester, there shall be TWO (2) mid-term examinations for 25 marks each. Each mid-term examination consists of one objective paper for TEN (10) marks, plus one subjective paper for 15 marks, with a duration of 120 minutes (20 minutes for objective and 100 minutes for subjective papers). Further, there shall be an allocation of 5 marks for assignment. The objective paper is set with multiple choice questions, True/

False, fill-in the blanks, matching type questions and short answer questions. Subjective paper shall contain 3 questions with internal choice, each for 5 marks. All three questions are to be answered.

ii. For "Logical Reasoning", a minor course, which is activity oriented, there shall be a continuous internal evaluation (CIE) during the semester for a total of 30 marks.

b) The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

c) The first assignment should be submitted before the conduct of the first mid-term examinations, and the second assignment should be submitted before the conduct of the second mid-term examinations. The assignments shall be as specified by the course instructor concerned.

d) The first mid-term examination marks and first assignment marks shall make one set of CIE marks , and the second mid-term examination marks and second assignment marks shall make second set of CIE Marks; and the average of these two sets of marks shall be taken as the final marks secured by the student in the Continuous Internal Evaluation in that theory course.

e) The details of the question paper pattern for Semester End Examination shall be as follows:

- The examination shall be conducted for 70 marks. The question paper consists of two parts:
  - Part – A for 20 marks (Compulsory);
  - Part – B for 50 marks (Questions with Internal Choice);
- Part – A: The question (numbered 01) under Part A consists of ten sub questions, two from each unit of the prescribed syllabus of the course. Each sub question carries 2 marks. All sub questions are compulsory.
- Part – B consists of five questions (numbered from 02 to 06), one each from the five units of the prescribed syllabus of the course. Each question carries 10 marks and may contain sub questions. For each question, there shall be an internal choice (it means, there shall be two questions from each unit, and the student should answer any one question). The student must answer all the questions of Part B.

Absence in mid-term examination(s):

- If any student is absent in one mid-term examination for any course on health grounds / any valid reasons approved by the College Academic Committee, only one test shall be conducted on all units by the college in each course at the end of each semester.
- If any student is absent in both mid-term examinations for any course on health grounds / any valid reasons approved by the College Academic Committee, only one test for 25 marks shall be conducted on all units and the marks secured out of 25 shall be divided by two, which shall be awarded against the said mid-term examination(s) after the student pays the prescribed fee.

9.3 For practical courses, there shall be a Continuous Internal Evaluation (CIE) during the semester for 30 marks, and 70 marks are assigned for lab/practical Semester End Examination (SEE). Out of the 30 marks for CIE, day-to-day work in the laboratory shall be evaluated for 15 marks; and for the remaining 15 marks - two internal practical tests (each of 15 marks) that include viva-voce shall be conducted by the concerned laboratory instructor and the average of these two tests is taken into account. The SEE for practicals shall be conducted at the end of the semester by two examiners, namely, an external examiner and laboratory faculty as internal examiner. The external examiner shall be appointed by the Chief Superintendent of Examinations of the college as per the recommendation of the Chairperson, Board of Studies of the department concerned. The panel of the external examiners shall be provided by the Chairperson, BoS at the commencement of the semester during the meeting of the BoS.

Absence in laboratory internal examinations:

- If any student is absent in one laboratory internal examination for any laboratory course on health grounds / for any valid reasons approved by the College Academic Committee, only one test shall be conducted for 15 marks on all experiments of that laboratory course, by the college at the end of the semester.
- If any student is absent in both the laboratory internal examinations on health grounds / for any valid reasons approved by the College Academic Committee, only one test shall be conducted on all experiments and the marks secured out of 15 marks shall be divided by two, which shall be awarded against the said laboratory internal examinations.

9.4 For the courses having design and/or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 30 marks for CIE (20 marks for day-to-day work, and 10 marks for internal tests) and 70 marks for SEE. There shall be two internal tests in a semester and the average of the two shall be considered for the award of marks for internal tests.

9.5 **Open Electives**: Students are to choose Open Elective(s) as per their programme structure.

9.6 a) There shall be an Industry Oriented Mini-Project, in collaboration with an industry of the relevant specialization, to be registered immediately after III Year II semester examinations, and taken up during the summer vacation for four weeks duration.

b) The industry oriented mini-project shall be submitted in a report form, and a presentation of the same shall be made before a committee, which evaluates it for 100 marks. The committee shall consist of Head of the Department, the supervisor of Mini-Project, and two Professors /Assoc-Professors faculty members of the

department. There shall be no internal marks for industry oriented Mini-Project. The mini-project shall be evaluated at the end of IV Year I Semester.

9.7 There shall be a project seminar presentation in IV Year I semester. For the project Seminar, the student shall collect the information/ literature on the project, prepare a report, submit the same, and present as a seminar, which shall be evaluated as CIE for 100 marks by the project seminar review committee. The committee shall consist of Head of the Department, the supervisor of project, and two Professors/Associate professors of the department.

9.8

9.8.1 There shall be a technical seminar presentation in IV year II Semester. For the technical seminar a student shall collect information on a specialized technical topic, prepare a technical report and submit to the department at the time of Technical Seminar presentation. The Technical Seminar presentation (along with the Technical Report) shall be evaluated by Two Professors /Assoc-Professors and Head of the Department, for 100 marks. There shall be no SEE for seminar.

9.8.2 For courses, namely, "Gender Sensitization" and "Human Values and Professional Ethics", which are activity oriented minor courses of two credits, there shall be a SEE for Seventy (70) marks which shall be conducted with internal examiner(s) only.

9.8.3. For "Logical Reasoning" an activity oriented course, there shall be a SEE for Seventy (70) marks which shall be conducted with internal examiner(s) only.

9.9 There shall be a comprehensive viva-voce examination (SEE) for 100 marks in IV year II semester. It shall be conducted by an external examiner, Head of the department and two Professors / Assoc-Professors of the department.

9.10 Each student shall start the major project work during the IV Year I Semester, as per the instructions of the project guide/ project supervisor assigned by the Head of Department. Out of a total 100 marks allotted for the major project work, which shall be evaluated in IV year II semester, 30 marks shall be for CIE (Continuous Internal Evaluation) and 70 marks for the SEE (End Semester Viva-voce Examination). The project viva-voce shall be conducted by a committee comprising an external examiner, Head of the Department and project supervisor. Out of 30 marks allocated for CIE, 15 marks shall be awarded by the project supervisor (based on the continuous evaluation of student's performance throughout the Project Work period), and the other 15 marks shall be awarded by a Departmental Committee consisting of Head of the Department and Project Supervisor, and two Professors/Assoc-Professors, based on the work carried out and the presentation made by the student during internal reviews (at least two internal reviews shall be conducted).

10.0 Grading Procedure

10.1 Marks shall be awarded to indicate the performance of each student in each theory course, or lab/practicals, or project seminar, technical seminar, or major project, or mini-project based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in section 9 above, and a corresponding letter grade shall be given.

10.2 As a measure of the student's performance, a 10-point absolute grading system using the following letter grades (UGC Guidelines) and corresponding percentage of marks shall be followed as mentioned in the table 10.2. Please also refer to section 8.

Table 10.2: Absolute grading system

% of Marks Secured in a course	***Letter Grade (UGC Guidelines)***	***Grade Points***
More than or equal to 90%	**O (Outstanding)**	**10**
80 and less than 90%	**A^+ (Excellent)**	**9**
70 and less than 80%	**A (Very Good)**	**8**
60 and less than 70%	**B^+ (Good)**	**7**
50 and less than 60%	**B (Average)**	**6**
40 and less than 50%	**C (Pass)**	**5**
Below 40%	**F (FAIL)**	**0**
Absent	**Ab**	**0**

10.3 A student obtaining F Grade in any course shall be considered '**FAILED**' and shall be required to reappear as 'supplementary candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his internal marks (CIE Marks) in those course(s) shall remain the same as those obtained earlier.

10.4 A letter grade does not imply any specific % of Marks.

10.5 In general, a student shall not be permitted to repeat any course(s) only for the sake of 'grade improvement' or 'SGPA/ CGPA improvement', However, he has to repeat all the courses pertaining to that semester, when he is detained due to shortage of attendance as listed in section 8.7.

10.6 A student earns Grade Point (GP) in each Course, on the basis of the letter grade obtained by him in that course. Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Course.
Credit Points (CP) = Grade Point (GP) x Credits …. for a course

10.7 The Student passes the course only when he gets GP ≥ 5 (C grade or above).

10.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a semester, by the Total Number of Credits registered during that semester. SGPA is rounded off to TWO decimal places. SGPA is thus computed as

$$SGPA = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \} \text{ .... For each Semester,}$$

where 'i' is the course indicator index (takes into account all courses in a semester), 'N' is the no. of courses 'REGISTERED' for the semester (as specifically required and listed under the Program Structure of the parent department), 'C_i' is the no. of credits allotted to the i^{th} course, and 'G_i' represents the Grade Points (GP) corresponding to the letter grade awarded for that i^{th} course.

10.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in ALL registered courses in ALL semesters, and the total number of credits registered in ALL the semesters. CGPA is rounded off to TWO decimal places. CGPA is thus computed from the I Year second semester onwards, at the end of each semester, as per the formula

$$CGPA = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ ... for all S Semesters registered}$$
$$\text{(ie., upto and inclusive of S Semesters, } S \geq 2 \text{)},$$

where 'M' is the TOTAL no. of courses (as specifically required and listed under the Course Structure of the parent department) the Student has 'REGISTERED' from the 1^{st} semester onwards up to and inclusive of the semester S (obviously M > N), 'j' is the course indicator index (takes into account all Courses from 1 to S Semesters),'C_j' is the no. of credits allotted to the j^{th} course, and 'G_j' represents the Grade Points (GP) corresponding to the letter grade awarded for that j^{th} Course. After registration and completion of I Year I semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

10.10 For merit ranking or comparison purposes, or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs shall be used.

10.11 For calculations listed in sections 10.6 through 10.10, performance in FAILED courses (securing F Grade) shall also be taken into account, and the credits of such courses shall also be included in the multiplications and summations.

10.12 Passing Standards:

10.12.1 A student shall be declared **'SUCCESSFUL'** or **'PASSED'** in a semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared **'SUCCESSFUL'** or **'PASSED'** in the entire B.Tech. programme, only when he gets a CGPA ≥ 5.00, subject to the condition that he secures a GP ≥ 5 (C Grade or above) in every registered course in each semester (during the entire B.Tech. Programme) for award of the degree.

10.12.2 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It shall show the details of the courses registered (course code, title, no. of credits, grade earned etc.), credits earned, SGPA, and CGPA.

11. Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed in sections 10.6 through 10.10.

11.2 For final % of marks equivalent to the computed final CGPA, the following formula is to be used:

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A student who registers for all the specified courses as listed in the programme structure, satisfies all the programme requirements, and passes all the examinations prescribed in the entire B.Tech. programme, and secures the required number of 192 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic Year, shall be declared to have **'QUALIFIED'** for the award of the B.Tech. degree in branch of Engineering studied.

12.2 A student who qualifies for the award of the degree as listed in section 12.1, shall be placed in the following classes based on evaluation as per section 8.5:

12.2.1 Students with final CGPA (at the end of the B. Tech Programme) ≥ 8.00, and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION' -

i. should have passed all the subjects/courses in 'FIRST APPEARANCE' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of his first academic year,
ii. should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from the I Year I semester onwards,
iii. should not have been detained or prevented from writing the Semester End Examinations in any semester due to shortage of attendance or any other reason,.

12.2.2 Students having final CGPA (at the end of B.Tech. Programme) ≥ 8.00, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

12.2.3 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

12.2.4 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

12.2.5 All other Students who qualify for the award of the degree (as per Section 12.1), with final CGPA (at the end of the B.Tech. Programme) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

12.3 A student with final CGPA (at the end of the B.Tech. Programme) < 5.00 shall not be eligible for the award of the degree.

12.4 Students fulfilling the conditions listed under section (iii) of 12.2.1 alone shall be eligible for the award of 'college rank' and / or 'gold medal'.

13.0 Withholding of Results

13.1 If the student has not paid fees to College at any stage, or has pending dues against his name due to any reason whatsoever, or if any case of indiscipline is pending against him, the result of the student may be withheld, and he shall not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0 Transitory Regulations

14.1 General

14.1.1 A Student who has discontinued for any reason, or has been detained for want of attendance or NOT promoted due to lack of required credits as specified, may be considered eligible for readmission to the same semester in which he got detained for want of attendance or promotion to the next year of study after securing the required number of credits, as detailed in 14.2 -14.4 as the case may be.

14.2 For students detained due to shortage of attendance:

14.2.1 A Student who has been detained in I year of R09/R13/R15 Regulations of JNTUH due to lack of attendance, shall be permitted to join I year I Semester of AR16 Regulations of GCET and he is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.

14.2.2 A student who has been detained in any semester of II, III and IV years of R09/R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding semester of AR16 regulations of GCET and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year.
The AR16 Academic Regulations of GCET under which a student has been readmitted shall be applicable to that student from that semester which shall include section 14.5

14.3 For students NOT promoted due to shortage of credits:

14.3.1 A student of R09/R13/R15 Regulations of JNTUH who has been detained due to lack of credits, shall be promoted to the next semester of AR16 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his/her first admission. For subsequent promotions the rule specified in section 14.5 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The AR16 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

14.4 For all students readmitted under AR16 Regulations of GCET:

14.4.1 A student who has failed in any course under any regulation has to pass those courses in the same regulations.

14.4.2 A student shall acquire a total of 192 credits for the award of degree. These 192 credits shall be the sum of all the credits secured in all the other regulations of his study (subsequent to normalization as per section 14.5) and those secured under AR16 Regulations of GCET.

14.4.3 If a student readmitted to AR16 Regulations of GCET, has any course with about 80% of syllabus in common with his previous regulations, that particular course in AR16 Regulations of GCET shall be substituted by another course to be suggested by GCET.

14.4.4 If a student readmitted to AR16 Regulations of GCET, has not studied any course/topics in his earlier regulations of study which is a prerequisite for further courses in AR16 Regulations of GCET, the College shall arrange to conduct remedial classes to cover those course/topics for the benefit of the students.

14.5 Promotion Rule

Where the credits allotted to a semester/year under the regulations studied in are different from that under AR16 regulations for the corresponding semester/year, the promotion rules of AR16 vide section 8.3 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under AR16 regulations and revising the secured credits also in the same proportion.

15.0 Student transfers

15.1 There shall be no branch transfers after the completion of admission process.

15.2 The student seeking transfer from various other universities/institutions has to pass the failed courses which are equivalent to the courses of GCET, and also pass the courses of GCET which the student has not studied at the earlier institution. Further, even if the student had passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of GCET, the student has to study those courses in GCET in spite of fact that those courses are repeated.

15.3 The transferred students from other universities/institutions shall be provided one chance to write the internal examinations in the failed courses and/or courses not studied as per the clearance (equivalence) letter issued by JNTUH.

16.0 Scope

i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".
ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".
iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
v) The college may change or amend the Academic Regulations, Program Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the College Authorities.
vi) B.Tech (Regular) program is B.Tech 4 year degree program to which students are admitted to I year
vii) B.Tech LE Scheme refers to the system under which students are admitted to II year of the B.Tech 4 year degree program.

*** * * * ***

PUNISHMENT FOR MALPRACTICE

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the

		candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he shall be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.

	means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is course to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.

ACADEMIC REGULATIONS 2016
For CBCS Based B.Tech. (Lateral Entry (LE) Scheme)

(Effective for the students admitted into II year from the Academic Year **2017-18** and onwards)

1.0 Eligibility for Admission

1.1 Admission to the B.Tech. Programme shall be made either on the basis of the merit rank obtained by the qualifying candidate at an entrance test conducted by the Telangana State Government (ECET), or the JNTUH, or on the basis of any other order of merit approved by JNTUH, subject to reservations as prescribed by the Government of Telangana from time to time.

Admissions under the Lateral Entry Scheme are made into the Second (II) year of the Four (4) – year degree program

2.0 Course Work:

2.1 A student, after securing admission, shall pursue the B.Tech. programme in a minimum period of 3 academic years, and a maximum period of 6 academic years (starting from the date of commencement of II Year).

2.2 Each student shall register for and secure the specified number of credits required for the completion of the B.Tech. programme and award of the B.Tech. degree in respective branch of Engineering.

2.3 Each semester is structured to provide typically 24 Credits, totaling to 144 credits for the entire B.Tech. (LE) programme.

3.0 Promotion rules

3.1 Case (i): A student registers for 24 credits or more in each semester as per the provision in section 5.2 of AR16 regulations of B.Tech (Regular) four year degree program.

3.1.1 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 29 credits out of 48 credits or more the student has registered up to and including II Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.1.2 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 58 credits out of 96 credits or more the student has registered up to and including III Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.2 Case (ii): A student registers for NOT less than 20 credits and less than 24 credits in each semester.

3.2.1 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including II year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.2.2 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including III year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

4.0 A Student shall register for all courses covering 144 credits as specified and listed (with the relevant courses as mentioned) in the Programme Structure, put up all the Attendance and Academic requirements for 144 Credits securing a minimum of C Grade (Pass Grade) or above in each course, and earn ALL 144 Credits securing SGPA $\geq$ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) $\geq$ 5.0, to successfully complete the B.Tech. programme.

4.1 A student must secure the necessary 144 credits as specified for the successful completion of the entire B.Tech. programme (see section 5.1); however, only 138 credits shall be considered for evaluating his overall performance for the award of class as provided for under section 5.0. These 138 credits shall be arrived at by leaving out two courses (one from open elective courses and one from professional elective courses) carrying a total of 6 credits, which have the least Grade point scores.

4.2 Students who fail to earn 144 credits as per the Programme Structure, and as indicated above, within 6 academic years from the date of commencement of their II Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

5.0 Award of Degree

5.1 A student who registers for all the specified courses as listed in the programme structure, satisfies all the programme requirements, and passes all the examinations prescribed in the entire B.Tech. programme, and secures the required number of 144 credits (with CGPA $\geq$ 5.0), within 6 academic years from the date of commencement of the second academic Year, shall be declared to have **'QUALIFIED'** for the award of the B.Tech. degree in the chosen branch of Engineering.

5.2 A student who qualifies for the award of the degree as listed in section 5.1, shall be placed in the appropriate class as follows based on evaluation as per section 4.1:

5.2.1 Students with final CGPA (at the end of the B. Tech Programme) ≥ 8.00, and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION'.

i. should have passed all the subjects/courses in 'FIRST APPEARANCE' within the first 3 academic years (or 6 sequential semesters) from the date of commencement of his first academic year,
ii. should have secured a CGPA ≥ 8.00, at the end of each of the 6 sequential semesters, starting from the II Year I semester onwards,
iii. should not have been detained or prevented from writing the Semester End Examinations in any semester due to shortage of attendance or any other reason, thereof.

5.2.2 Students having final CGPA (at the end of B.Tech. Programme) ≥ 8.00, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

5.2.3 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

5.2.4 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

5.2.6 All other Students who qualify for the award of the degree (as per section 5.1), with final CGPA (at the end of the B.Tech. Programme) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

5.3 A student with final CGPA (at the end of the B.Tech. Programme) < 5.00 shall not be eligible for the award of the degree.

5.4 Students fulfilling the conditions listed under Item (iii) of 5.2.1 alone shall be eligible for the award of 'college rank' and / or 'gold medal'.

6.0 Transitory Regulations

6.1 General

6.1.1 A Student who has discontinued for any reason, or has been detained for want of attendance or NOT promoted due to lack of required credits as specified, may be considered eligible for readmission to the same semester in which he got detained for want of attendance or promotion to the next year of study after securing the required number of credits, as detailed in sections 6.2 through 6.4 as the case may be.

6.2 For students detained due to shortage of attendance:

6.2.1 A student who has been detained in any semester of II, III and IV years of R09/R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding

semester of AR16 regulations of GCET and is required to complete the study of B.Tech. within the stipulated period of six academic years from the date of first admission in II Year.

The AR16 Academic Regulations of GCET under which a student has been readmitted shall be applicable to the student from that semester which shall include section 6.5.

6.3 For students NOT promoted due to shortage of credits:

6.3.1 A student of R09/R13/R15 Regulations of JNTUH who has NOT been promoted due to lack of credits, shall be promoted to the next semester under AR16 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his/her first admission. For subsequent promotions, the rule specified in section 6.5 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of SIX academic years from the year of first admission. The AR16 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

6.4 For all students readmitted under AR16 Regulations of GCET:

6.4.1 A student who has failed in any course under any regulation has to pass those courses in the same regulations.

6.4.2 A student shall acquire a total of 144 credits for the award of degree. These 144 credits shall be the sum of all the credits secured in all the other regulations of his study (subsequent to normalization as per section 6.5) and those secured under AR16 Regulations of GCET.

6.4.3 If a student readmitted to AR16 Regulations of GCET, has any course with about 80% of syllabus in common with his previous regulations, that particular course in AR16 Regulations of GCET shall be substituted by another course to be suggested by GCET.

6.4.4 If a student readmitted to AR16 Regulations of GCET, has not studied any course/topics in his earlier regulations of study which is a prerequisite for further courses in AR16 Regulations of GCET, the College shall arrange to conduct remedial classes to cover those course/topics for the benefit of the students.

6.5 Promotion Rule

Where the credits allotted to a semester/year under the regulations studied in are different from that under AR16 regulations for the corresponding semester/year, the promotion rules of AR16 vide section 3.0 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under AR16 regulations and revising the secured credits also in the same proportion.

7.0 All the other regulations as applicable to B.Tech 4 – year degree program (Regular) shall hold good for B.Tech LE Scheme.

PUNISHMENT FOR MALPRACTICE

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the

		candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he shall be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.

	means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is course to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

To impart quality technical education in Electronics and Communication Engineering emphasizing analysis, design/synthesis and evaluation of hardware/ embedded software, using various Electronic Design Automation (EDA) tools with accent on creativity, innovation and research thereby producing competent engineers who can meet global challenges with societal commitment.

MISSION

- To impart quality education in fundamentals of basic sciences, mathematics, electronics and communication engineering through innovative teaching-learning processes.
- To facilitate Graduates define, design, and solve engineering problems in the field of Electronics and Communication Engineering using various Electronic Design Automation (EDA) tools.
- To encourage research culture among faculty and students thereby facilitating them to be creative and innovative through constant interaction with R & D organizations and Industry.
- To inculcate teamwork, imbibe leadership qualities, professional ethics and social responsibilities in students and faculty.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I. To prepare students with excellent comprehension of basic sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.

II. To train students with problem solving capabilities such as analysis and design with adequate practical skills that are Program Specific wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

III. To inculcate positive attitude, professional ethics, effective communication and interpersonal skills which would facilitate them to succeed in the chosen profession exhibiting creativity and innovation through research and development both as team member and as well as leader.

PROGRAM 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, 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**: The problems
   - that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline.
   - that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions.
   - that require consideration of appropriate constraints/requirements not explicitly given in the problem statement. (like: cost, power requirement, durability, product life, etc.).
   - which need to be defined (modeled) within appropriate mathematical framework.
   - that often require use of modern computational concepts and tools.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1. An ability to design an Electronics and Communication Engineering system, component, or process and conduct experiments, analyze, interpret data and prepare a report with conclusions to meet desired needs within the realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
2. An ability to use modern Electronic Design Automation (EDA) tools, software and electronic equipment to analyze, synthesize and evaluate Electronics and Communication Engineering systems for multidisciplinary tasks.

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
B.Tech. ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC REGULATIONS: AR 16

PROGRAM STRUCTURE

FIRST YEAR SEMESTER - I

S.No	Course Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1.	16EN1101	English – I	HS	2	-	-	30	70	100	2
2.	16PH1101	Engineering Physics	BS	3	1	-	30	70	100	3
3.	16MA1101	Mathematics - I	BS	4	1	-	30	70	100	4
4.	16CH1101	Engineering Chemistry	BS	3	-	-	30	70	100	3
5.	16CS1101	Computer Programming - I	ES	3	-	-	30	70	100	3
6.	16ME1101	Engineering Drawing	ES	2	-	3	30	70	100	4
7.	16EN11L1	English - I Lab	HS	-	-	2	30	70	100	1
8.	16CH11L1	Engineering Chemistry Lab	BS	-	-	3	30	70	100	2
9.	16CS11L1	Computer Programming - I Lab	ES	-	-	3	30	70	100	2
TOTAL				**17**	**2**	**11**	**270**	**630**	**900**	**24**

FIRST YEAR SEMESTER - II

S.No	Course Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1.	16EN1201	English – II	HS	2	-	-	30	70	100	2
2.	16PH1201	Applied Physics	BS	4	1	-	30	70	100	4
3.	16MA1201	Mathematics - II	BS	3	1	-	30	70	100	3
4.	16MA1202	Mathematics - III	BS	3	-	-	30	70	100	3
5.	16CS1201	Computer Programming - II	ES	3	-	-	30	70	100	3
6.	16EN12L1	English - II Lab	HS	-	-	2	30	70	100	1
7.	16PH12L1	Applied Physics Lab	BS	-	-	3	30	70	100	2
8.	16MA12L1	Computational Mathematics Lab	BS	-	-	3	30	70	100	2
9.	16CS12L1	Computer Programming-II Lab	ES	-	-	3	30	70	100	2
10.	16WS12L1*	Information Technology Workshop (ITWS) / Engineering Workshop (EWS)	ES	-	-	3	30	70	100	2
TOTAL				**15**	**2**	**14**	**300**	**700**	**1000**	**24**

* CSE BoS specified the syllabus for ITWS while ME BoS specified the syllabus for EWS.

Abbreviation	Description
HS	Humanities and Social Sciences
BS	Basic Sciences
ES	Engineering Sciences
PC	Professional Core
SC	Soft Core
OE	Open Elective
CC	Core Course
PE	Professional Elective

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
C	Number of Credits
D	Drawing
CIE	Continuous Internal Evaluation
SEE	Semester End Examination
Tot	Total

SECOND YEAR SEMESTER – I

S.No	Course Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1.	16MA2103	Complex Variables	BS	3	1	-	30	70	100	3
2.	16EC2101	Electronic Devices and Circuits	PC	4	1	-	30	70	100	4
3.	16EC2102	Theory of Signals and Systems	PC	4	1	-	30	70	100	4
4.	16EC2103	Switching Theory and Logic Design	PC	3	1	-	30	70	100	3
5.	16EE2103	Electrical Circuits and Electrical Technology	ES	4	1	-	30	70	100	4
6.	16EC21L1	Electronic Devices and Circuits Lab	PC	-	-	3	30	70	100	2
7.	16EC21L2	Simulation lab-I	PC	-	-	3	30	70	100	2
8.	16EE21L2	Electrical Engineering Lab	ES	-	-	3	30	70	100	2
TOTAL				**18**	**5**	**9**	**240**	**560**	**800**	**24**

SECOND YEAR SEMESTER – II

S.No	Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1.	16EC2201	Pulse, Digital and Switching Circuits	PC	3	1	-	30	70	100	3
2.	16EC2202	Electronic Circuit Analysis	PC	3	1	-	30	70	100	3
3.	16EC2203	Electromagnetic Theory and Transmission Lines	PC	4	1	-	30	70	100	4
4.	16EC2204	Analog Communications	PC	3	1	-	30	70	100	3
5.	16CH2201	Environmental Studies	HS	3	-	-	30	70	100	3
6.	16EC22L1	Electronic Circuits and Pulse Circuits Lab	PC	-	-	3	30	70	100	2
7.	16EC22L2	Analog Communications Lab	PC	-	-	3	30	70	100	2
8.	16EC22L3	Simulation Lab-II	PC	-	-	3	30	70	100	2
9.	16HS22L1	Gender Sensitization	HS	-	-	3	30	70	100	2
TOTAL				**16**	**4**	**12**	**270**	**630**	**900**	**24**

THIRD YEAR SEMESTER – I

S.No	Course Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1.	16EC3101	Linear and Digital IC Applications	PC	4	1	-	30	70	100	4
2.	16EC3102	Microprocessors and Microcontrollers	PC	3	1	-	30	70	100	3
3.	16EC3103	Antennas and wave Propagation	PC	4	-	-	30	70	100	4
4.	16MB3101	Management Science	HS	3	-	-	30	70	100	3
5.	**Open Elective – I**		OE	3	-	-	30	70	100	3
	16MB3121	Intellectual Property Rights								
	16EE3122	Industrial Safety and Hazards								
	16CS3123	JAVA Programming								
	16ME3125	Nano Materials and Technology								
	16CE3126	Global Warming and Climate Change								
6.	16EC31L1	Microprocessors and Microcontrollers Lab	PC	-	-	3	30	70	100	2
7.	16EC31L2	IC Applications and HDL Simulation Lab	PC	-	-	3	30	70	100	2
8.	16EN31L1	Advanced English Communication Skills Lab	HS	-	-	3	30	70	100	2
9.	16MA31P1	Logical Reasoning	BS	-	-	2	30	70	100	1
TOTAL				**17**	**2**	**11**	**270**	**630**	**900**	**24**

THIRD YEAR SEMESTER – II

S.No	Course Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P / D	CIE	SEE	Tot	C
1.	16EC3201	Digital Signal processing	PC	3	1	-	30	70	100	3
2.	16EC3202	Digital Communications	PC	3	1	-	30	70	100	3
3.	16EC3203	Control Systems Engineering	PC	3	1	-	30	70	100	3
4.	**Professional Elective – I**		PE	3	1	-	30	70	100	3
	16EC3204	Electronic Instrumentation and Measurements								
	16EC3205	Telecommunication Switching Systems and Networks								
	16EC3206	Digital Systems Design								
5.	**Professional Elective – II**		PE	3	1	-	30	70	100	3
	16EC3207	Optical Communications								
	16EC3208	Computer Architecture and Organization								
	16CS3212	Computer Networks								
6.	**Soft Core – I**		SC	3	-	-	30	70	100	3
	16EC3209	Digital Design through Verilog HDL								
	16EC3210	VLSI Design								
7.	16EC32L1	Digital Signal Processing Lab	PC	-	-	3	30	70	100	2
8.	**Soft Core - I lab**		SC	-	-	3	30	70	100	2
	16EC32L2	Digital Design through Verilog HDL Lab								
	16EC32L3	VLSI Lab								
9.	16MB32P1	Human Values and Professional Ethics	HS	-	-	3	30	70	100	2
TOTAL				**18**	**5**	**9**	**270**	**630**	**900**	**24**

FOURTH YEAR SEMESTER – I#

S.No	Course Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1.	16EC4101	Microwave Engineering	PC	3	1	-	30	70	100	3
2.	16EC4102	Cellular and Mobile Communications	PC	3	1	-	30	70	100	3
3.	**Professional Elective – III**		PE	3	-	-	30	70	100	3
	16EC4103	Digital Signal processors and Architecture								
	16EC4104	Satellite Communications								
	16EC4105	Digital Image Processing								
4.	**Soft Core – II**		SC	3	-	-	30	70	100	3
	16EC4106	Embedded Systems								
	16CS4110	Android Application Development								
5.	**Open Elective – II**		OE	3	-	-	30	70	100	3
	16MB4131	Supply Chain management								
	16CS4132	Knowledge Management								
	16EE4133	Energy Conservation and Management								
	16ME4135	Manufacturing Processes								
	16CE4136	Building Technology								
6.	**Open Elective – III**		OE	3	-	-	30	70	100	3
	16MB4141	Banking and Insurance								
	16CS4142	Database Systems								
	16EE4143	Micro-Electro-Mechanical Systems								
	16ME4145	Aspects of Heat Transfer in Electronically Controlled Units								
	16CE4146	Green Buildings								
	16EN4147	Foreign Language - French								
	16EN4148	Foreign Language - Spanish								
	16EN4149	Foreign Language - German								
7.	16EC41L1	Microwave Engineering & Digital Communications Lab	PC	-	-	3	30	70	100	2

8.	**Soft core Lab – II**		SC	-	-	3	30	70	100	2
	16EC41L2	Embedded Systems Lab								
	16CS41L3	Android Application Development Lab								
9.	16EC4107	Industry oriented mini-project	CC	-	-	-	-	100	100	1
10.	16EC4108	Major Project Seminar	CC	-	-	2	100	-	100	1
TOTAL				**18**	**2**	**8**	**340**	**660**	**1000**	**24**

FOURTH YEAR SEMESTER – II#

S.No	Course Code	Course	Category	No. of Periods Per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1.	16MB4201	Financial Analysis and Project Management	HS	4	-	-	30	70	100	4
2.	**Professional Elective – IV**		PE	3	-	-	30	70	100	3
	16EC4201	Wireless Communication Networks								
	16EC4202	Radar Systems								
	16CS4208	Database Management Systems								
3.	**Open Elective – IV**		OE	3	-	-	30	70	100	3
	16MB4251	Entrepreneurship								
	16CS4252	Web Development								
	16EE4253	Renewable Energy Sources								
	16ME4255	Materials Handling								
	16CE4256	Disaster Mitigation and Management								
	16MA4257	Actuarial Statistics								
4.	16EC4203	Major Project	CC	-	-	15	30	70	100	10
5.	16EC4204	Technical Seminar	CC	-		2	100	-	100	1
6.	16EC4205	Comprehensive Viva	CC	-	-	-	-	100	100	3
TOTAL				**10**	**0**	**17**	**220**	**380**	**600**	**24**

 # Subject to the approval of Academic Council

Comparison of AICTE Guidelines for Curriculum structure of B.Tech Degree program in Electronics and Communication Engineering Vis-à-vis GCET Program

S. No.	*Broad Course Classification*	*Course Group/ Category*	*Course Description*	*Proposed Credits (%)*	*Range of Credits given by AICTE (%)*
1.	**Foundation Courses (FnC)**	**BS – Basic Sciences**	Includes - Mathematics, Physics and Chemistry Subjects	**30 (15.62%)**	**15% - 20%**
2.		**ES - Engineering Sciences**	Includes fundamental engineering subjects	**22 (11.45%)**	**15% - 20%**
3.		**HS – Humanities and Social Sciences**	Includes subjects related to Humanities, Social Sciences and Management	**20 (10.41%)**	**5%-10%**
4.	**Core Courses (CoC)**	**PC - Professional Core**	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	**69 (35.93%)**	**30% - 40%**
5.	**Elective Courses (ElC)**	**SC - Soft Core**	Includes core elective courses with the associated lab	**10 (5.2%)**	**10% -15%**
		PE - Professional Electives	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	**13 (6.77%)**	
6.		**OE – Open Electives**	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	**12 (6.2%)**	**5% - 10%**
7.	**Core Courses**	**Project Work**	B.Tech. Project or UG Project or UG Major Project	**16 (8.33%)**	**10% - 15%**
8.		**Industrial Training/ Mini-Project**	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project		
9.		**Seminar**	Seminar/ Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.		
10.		**Minor Courses**	1 or 2 Credit Courses (subset of HS)	**included**	
Total Credits for B. Tech. Program				**192 (100%)**	

OPEN ELECTIVES

(Open Elective course offered by a department SHOULD NOT be taken by the students of the same department)

Open Elective I

S. No.	Course Title	Course Code
21	Intellectual Property Rights (MBA)	16MB3121/16MB3221
22	Industrial Safety and Hazards (EEE)	16EE3122/16EE3222
23	JAVA Programming (CSE)	16CS3123/16CS3223
24	Electronic Measuring Instruments (ECE)	16EC3124/16EC3224
25	Nano Materials and Technology (ME)	16ME3125/16ME3225
26	Global Warming and Climate Change (CE)	16CE3126/16CE3226

Open Elective II

S. No.	Course Title	Course Code
31	Supply Chain Management (MBA)	16MB3231/16MB4131
32	Knowledge Management (CSE)	16CS3232/16CS4132
33	Energy Conservation and Management (EEE)	16EE3233/16EE4133
34	Basics of Communication Systems(ECE)	16EC3234/16EC4134
35	Manufacturing Processes (ME)	16ME3235/16ME4135
36	Building Technology (CE)	16CE3236/16CE4136

Open Elective III

S. No.	Course Title	Course Code
41	Banking and Insurance (MBA)	16MB3241/16MB4141
42	Database Systems (CSE)	16CS3242/16CS4142
43	Micro-electro-mechanical Systems(EEE)	16EE3243/16EE4143
44	Principles of Wireless Communication Systems (ECE)	16EC3244/16EC4144
45	Aspects of Heat Transfer in Electronically Controlled Units(ME)	16ME3245/16ME4145
46	Green Buildings (CE)	16CE3246/16CE4146
47	Foreign Language – French	16EN3247/16EN4147
48	Foreign Language –Spanish	16EN3248/16EN4148
49	Foreign Language –German	16EN3249/16EN4149

Open Elective IV

S. No.	Course Title	Course Code
51	Entrepreneurship (MBA)	16MB4251
52	Web Development (CSE)	16CS4252
53	Renewable Energy Sources (EEE)	16EE4253
54	Biomedical Instrumentation (ECE)	16EC4254
55	Materials Handling (ME)	16ME4255
56	Disaster Mitigation and Management (CE)	16CE4256
57	Actuarial Statistics (S&H)	16MA4257

16EN1101 - ENGLISH - I

I Year B.Tech. I Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): None

Course Objectives

Develop ability to

1. Read well and speak grammatically correct English.
2. Become a good communicator, both written and oral.
3. Analyze, interpret the given data/text and infer appropriately.
4. Design an outline for a paragraph, essay, letters etc.
5. Listen actively and respond accordingly.
6. Apply classroom learning to conduct oneself in a multicultural environment.

Course Outcomes:

At the end of the course, student would be able to

CO 1. Speak fluent, intelligible and grammatically correct English

CO 2. Use language appropriately in various functional contexts

CO 3. Analyze a given situation / text and interpret accordingly.

CO 4. Write effectively in formal and informal situations

CO 5. Acquire active listening skills and demonstrate the same.

CO 6. Acquire the nuances of behavioral etiquette in a multicultural environment.

UNIT-I

Reading	*Tea Party* by Ruth Prawer Jhabvala
Vocabulary	Homonyms, Homophones Homographs
Grammar	Nouns and Articles, Types of Verbs
Speaking	Greeting people and taking leave, Introducing oneself and others
Writing	Writing sentences, Punctuation

UNIT-II

Reading	1. *Risk Management* by Joe Crompton 2. *Sivakasi* by Amrutha Gayatri
Vocabulary	1. Synonyms 2. Antonyms and Synonyms, Commonly misspelt words
Grammar	1. Subject-verb agreement 2. The present tense
Speaking	Giving Directions
Writing	Paragraph Writing, Note making, Note taking

UNIT-III

Reading	1. *Polymer Banknotes* 2. *The one thing every business executive must understand about social media* by Kerpen
Vocabulary	1. Collocations 2. Technical Vocabulary
Grammar	1. Past Tense & Future Tense 2. Adjectives – Comparison, Prepositions
Speaking	1. Group Discussions 2. Speaking on the telephone (Telephone Etiquette)
Writing	Information Transfer

UNIT-IV

Reading	1. *IF* by Rudyard Kipling 2. *Courage and integrity are at the core of the successful leadership*
Vocabulary	1. Positive descriptive vocabulary, Common errors in English 2. Idioms and Phrases
Grammar	1. Reported Speech 2. Active voice& passive voice
Speaking	1. Talking about hypothetical situations 2. Narrating experiences/events and expressing opinions
Writing	1. Letter Writing 2. Phrasal Verbs 3. Guided Composition

UNIT-V

Reading	Study Skills
Vocabulary	Functional vocabulary related to writing and reading
Grammar	Picture Reading/ Interpretation
Writing	Job Application, Narrative, Reviews-articles/newspaper/books/movies, Essay/articles

Text Book: Skills Annexe: Functional English for Success published by Orient Longman

Reference Books

1. Contemporary English Grammar Structures and Composition by David Green, Macmillan Publishers 2010, New Delhi
2. Innovate with English: A course in English for Engineering students by T Samson, Foundation Books
3. English Grammar Practice by Raj N Bakshi, Orient Longman
4. Spoken English by R.K.Bansal and Harrison, Orient Longman
5. Technical Communication by Meenakshi Raman, Oxford University Press
6. Grammar Games by Renuvolcuri Mario, Cambridge University Press
7. Enrich Your English by Thakur K.B.P. Sinha, Vijay Nicole Imprints Pvt.Ltd.

16PH1101 - ENGINEERING PHYSICS

I Year. B.Tech. I Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): None

Course objectives:
Develop ability to

1. Understand the fundamental aspects of crystal structures, various types of crystal defects and methods of determining the crystal structures using X- ray diffraction.
2. Distinguish different types of dielectric polarization mechanisms; understand the properties of different dielectric materials and their applications.
3. Demonstrate classification of magnetic materials; understand the phenomenon of superconductivity and the applications of magnetic materials and superconductors.
4. Understand the concepts of interference, diffraction, light amplification, working of various types of LASERs and their applications.
5. Outline the behavior of materials at nano scale, three methods of preparation of nano materials and their characterization techniques with applications.

Course Outcomes:
After completion of the course, student would be able to

CO 1. Explain the fundamentals of crystal structures; summarize various crystal defects and methods of determining the crystal structures using X-Rays.
CO 2. Explain different types of dielectric polarization mechanisms, and the properties of different dielectric materials and their applications.
CO 3. Explain different types of magnetic materials, phenomenon of superconductivity and applications of magnetic materials and superconductors.
CO 4. Explain phenomena of interference, diffraction, and light amplification process, construction and working of Ruby, He-Ne, Semiconductor LASERs and their applications in different fields.
CO 5. Illustrate awareness of sol-gel method, physical vapour deposition method and ball milling method for preparation of nano materials and their applications.

UNIT I

Crystallography and X-Ray diffraction

Space lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, atomic radius, coordination number and atomic packing factors of simple cubic, body centered cubic, face centered cubic, and diamond structure. Crystal directions & planes, Miller indices, inter planar spacing of orthogonal crystal systems.

Defects in crystal: Point defects, line defects (Qualitative Treatment). Estimation of Schottky and Frenkel defects, Burger's vector. Bragg's law, X-Ray diffraction- Laue method and powder method. Applications of X-Rays in different fields.

UNIT II

Dielectric properties

Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic and ionic polarizations (Quantitative), orientation and space charge polarizations (qualitative). Internal fields in solids, Clausius-Mosotti equation, Piezo, Pyro & Ferro electricity and their applications.

UNIT III

Magnetic Properties

Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment, Bohr magneton, classification of Dia, Para, Ferro, Antiferro and Ferri magnetic materials; domain theory of Ferro magnetism- Hysteresis curve, soft and hard magnetic materials, applications of magnetic materials. Basic concepts of superconductivity and properties of super conductors: Type –I, Type – II super conductors, BCS theory (Qualitative), applications of superconductors in science and engineering.

UNIT IV

Optics and LASERs

Introduction to interference, theory of interference in thin films, Newton's rings, anti reflection coatings; introduction to diffraction, diffraction due to single slit, double slit and diffraction grating. LASERs and their characteristics, stimulated absorption, spontaneous emission and stimulated emission, Einstein's coefficients and relation between them, pumping schemes, optical resonator, various types of Lasers: Ruby Laser, He-Ne Laser, Semiconductor Laser and applications of Lasers.

UNIT V

Nanoscience

Origin of Nanoscience, Nanoscale, classification of nanomaterials- surface to volume ratio, Quantum confinement, synthesis of nano materials – sol gel method, physical vapour deposition method, ball milling method; properties of nanomaterials, characterization of nanomaterials using Scanning Electron Microscope(SEM), Transmission Electron Microscope(TEM), Applications of nanoscience in various fields.

TEXT BOOKS:

1. Engineering Physics, K. Malik, A. K. Singh, TMH
2. Engineering Physics, M N Avadhanulu, S Chand & Co.

REFERENCES:

1. Introduction to Solid state physics by – Kittel, 8th edition, John Wesley
2. Fundamentals of Physics, David Halliday, John Weily Publishers.
3. University Physics, Sear's and Zemansky (10th Edition), Wesley Publishers.
4. Applied Physics, PK Mittal, IK int. Publishing House
5. Engineering Physics, V. Rajendran, TMH.

16MA1101– MATHEMATICS – I

I Year B.Tech. I Sem
Prerequisite(s): None

L	T	P/D	C
4	1	-/-	4

Course Objectives:
Develop ability to

1. Understand various types of Matrices, properties and rank of a matrix to find the solution for system of equations, if it exists.
2. Apply the knowledge of eigenvalues and eigenvectors of a matrix from quadratic form into a canonical form through linear and orthogonal transformations.
3. Identify the methods of solving the differential equations of first order and applications in engineering problems namely, Newton's law of cooling, Natural growth and decay.
4. Solve second and higher order differential equations and apply the same to electrical circuits and simple harmonic motion.
5. Analyse properties of Laplace Transform, Inverse Laplace Transform and convolution theorem and apply the same to solve ordinary differential equations.

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

CO 1. Write the matrix representation of a set of linear equations and analyze solutions of a system of equations.
CO 2. Deduce eigenvalues and eigenvectors of a matrix and apply the same to reduce quadratic form into a canonical form through linear and orthogonal transformations.
CO 3. Identify the type of differential equation and use the appropriate method to solve the same.
CO 4. Apply differential equations to solve engineering problems particularly, electrical circuits and simple harmonic motion.
CO 5. Solve ordinary differential equations of second and higher order using Laplace Transform techniques.

UNIT-I
Theory of Matrices-I
Real matrices-symmetric, Skew-symmetric, Orthogonal, Complex matrices**:** Hermitian, Skew Hermitian, Unitary Matrices and Idempotent Matrix, Finding rank of a matrix by reducing to Echelon and Normal forms, Inverse of a non-singular matrix using row/column transformations (Gauss-Jordan method). Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix, Solving m**x**n and n**x**n linear system of equations by Gauss elimination.

UNIT- II
Theory of Matrices-II
Cayley-Hamilton Theorem(without proof)-Verification, Calculating inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of

Vectors, Linear Transformation-Orthogonal Transformation, Eigen values and eigenvectors of a matrix, Properties of eigen values and eigenvectors of real and complex matrices, Linearly independent eigenvectors of a matrix when the eigen values of the matrix are repeated, Quadratic forms up to three variable, Rank-Positive definite, negative definite, semi-definite, Index, signature of a quadratic form.

UNIT – III

First Order Ordinary Differential Equations

Differential equations- exact, linear and Bernoulli, Applications of first order differential equations-Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories. Electrical Circuits.

Unit-IV

Higher Order Ordinary Differential Equations

Linear, homogeneous and non-homogeneous differential equations of second and higher order with constant coefficients, Non homogeneous of the type e^{ax}, sin ax, cos ax and x^n, $e^{ax}V(x)$, $x^nV(x)$ and Method of variation of parameters, Applications of second order differential equations to Electrical circuits and simple harmonic motion.

UNIT-V

Laplace transform

Definition of Laplace transform, domain of the function and Kernel for the Laplace transforms. Existence of Laplace transforms. Laplace transform of standard functions, first shifting theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions-Unit step function-second shifting theorem-Dirac's delta function, Periodic function-Inverse Laplace transform by Partial fractions (Heaviside method), Inverse Laplace transforms of functions when they are multiplied or divided by "s". Inverse Laplace transforms of derivatives and integrals of functions, Convolution theorem-Applications to ordinary differential equations.

Text Books:

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.

Reference Books:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.
2. Engineering Mathematics by Srimanta pal, subhodh C.Bhunia, Oxford higher Education.
3. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
4. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC
5. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.
6. Ordinary & Partial Differential Equations, M D Raisinghania, S. Chand .Publications

16CH1101 - ENGINEERING CHEMISTRY

I Year B.Tech. I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. Define and understand various conductances in electrochemistry, functional working of electrodes, different types of batteries and cells along with their applications.
2. Understand the concept of corrosion; distinguish various types of corrosion and prevention.
3. Identify the causes of hardness in water and its treatment using various techniques.
4. Classify polymers and their applications, understand different mechanisms of polymerization and understand different fibers along their applications.
5. Understand the engineering materials namely, cement, lubricants, ceramics and glass.
6. Understand various adsorption techniques and its applications.

Course Outcomes

At the end of the course, student would be able to

CO 1. Explain
   a. various conductances in electrochemistry
   b. functional working of electrodes
   c. construction and working of different types of batteries and cells along with their functional differences and applications.

CO 2. Explain corrosion and causes of corrosion, distinguish various types of corrosion and explain various methods to prevent corrosion.

CO 3. Explain hardness in water and various techniques used to treat the same.

CO 4. Distinguish clearly various polymers and various synthetic and natural fibers; explain various polymerisation processes.

CO 5. Explain the properties of various materials namely, cement, lubricants, ceramics and glass and their applications.

CO 6. Explain various adsorption techniques and its applications.

UNIT I

Electrochemistry and Batteries

Electro Chemistry: Conductance -Specific, Equivalent and Molar, their Units;

EMF**:** Galvanic Cell; types of Electrodes: Calomel, Quinhydrone and Glass; Nernst equation and its applications; Concentration cells, determination of pH using glass electrode-Numerical problems.

Batteries: Introduction, types of batteries: Primary cells and secondary cells, differences between them with examples.

Fuel cells: Hydrogen-Oxygen fuel cell; applications of fuel cells.

UNIT II

Corrosion and its control methods

Corrosion: Introduction, definition, Types of Corrosion and disadvantages of corrosion. Mechanism of corrosion- chemical and electrochemical corrosion. Factors affecting rate of corrosion– Nature of metal and Nature of Environment –Electrochemical series and its applications, Corrosion control methods–Cathodic protection (sacrificial anodic and impressed current).

Surface coatings: Metallic coatings and methods of application of metallic coatings –hot dipping (galvanization and tinning) , Electro plating (Copper plating) and Electroless plating (Niplating) –

Organic coatings: Paints-constituents and their functions.

UNIT III

Water and its treatment

Hardness of Water**:** Types of hardness-temporary and permanent, units and interrelation between them, Boiler troubles–Scale and sludge, Priming and foaming, Caustic embrittlement- Treatment of boiler feed water–Internal treatment (Colloidal and Calgon conditioning)–External treatment–Zeolite process, ion exchange process. Potable water- Steps involved in treatment of potable water–Disinfecting water by chlorination and ozonization – Reverse Osmosis and its significance.

UNIT IV

Polymers

Introduction: Classification of polymers, Types of Polymerization–addition and condensation, differences between addition and condensation polymers, Mechanism of free radical addition polymerization.

Plastics: Thermoplastic &Thermosetting resins, differences between thermoplastic and thermosetting polymers. Preparation, properties and engineering applications of PVC, Teflon and Bakelite.

Fibers: Introduction, types- natural and synthetic**.** Preparation, properties and uses of Nylon–6, 6, Nylon 6, 10. Fiber Reinforced Plastic (FRP) –Carbon fiber reinforced plastic and applications.

UNIT V

Materials and Surface Chemistry

A) Materials Chemistry

Cement –Introduction, Types of Cement, setting and hardening of Portland cement, Reinforced Concrete.

Lubricants–Characteristics of good lubricant, properties– flash and fire, cloud and pour point and their significance, Nano Fabricated Lubricants

Ceramics- Advanced Ceramics

Glass– Reinforced glass material.

B) Surface Chemistry

Adsorption– Introduction, Types of adsorption, Isotherms– Freundlich and Langmuir adsorption isotherm, applications of adsorption, Application of adsorption in heterogeneous catalysis (automotive catalysts)

Colloids– Definition, optical properties and applications of colloids in industry.

Text Books:

1. Engineering Chemistry by R.P. Mani,K.N. Mishra, B. Rama Devi /CENGAGE learning.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

Reference Books:

1. Engineering Chemistry by B. Siva Shankar McGraw Hill Publishing Company Limited, New Delhi (2006)
2. Engineering Chemistry J.C. Kuriacase and J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).
3. Text Book of Engineering Chemistry by S.S. Dara and Mukkati , S.Chand & Co Publishers, New Delhi (2006)
4. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.
5. An Introduction to Electro Chemistry by Samuel Glassstone, East-West Pvt.ltd.
6. Corrosion Engineering by Mars G,Fontana, McGraw Hill

16CS1101 – COMPUTER PROGRAMMING - I

I Year B.Tech. I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. Understand the intricacies of program development and problem solving techniques using Raptor tool.
2. Understand the structure of a C language Program, list, describe, classify the C data types, input and output concepts as they apply to programs in C.
3. Describe the expression types; understand the rules of precedence and associativity in evaluating the expressions.
4. Understand how a C program evaluates logical and repetitive (loop) statements.
5. Describe the importance of modularity and design multi-function programs.
6. Understand the basic concepts and uses of arrays using C language Program.
7. Understand the concept and use of pointers for memory management techniques.

Course Outcomes

After completion of the course, students would be able to

- CO1. Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool.
- CO2. Incorporate the concept of variables, constants and basic data types in a C language program.
- CO3. Use simple input and output statements in a C language Program.
- CO4. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.
- CO5. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
- CO6. Implement C programs using arrays.
- CO7. Write and execute programs that access and manage data through pointers.

UNIT – I

Basics of Computers

Logic Building: Flow chart, Algorithm, Pseudo code. Introduction to Raptor Programming Tool

Introduction to Programming – Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Data Types, Variables, Constants, Input/output functions.

Operators - Arithmetic, relational, logical, bitwise, conditional, increment/decrement, assignment etc.., C program examples. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions.

UNIT – II

Statements- Selection Statements (decision making) – if and switch statements with Raptor Tool, and C program examples.

Repetition statements (loops) - while, for, do-while statements with Raptor Tool, and C Program examples

Statements related to looping – break, continue, goto, Simple C Program examples.

UNIT - III

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, C program examples.

Recursion- recursive functions, Limitations of recursion, example C programs

UNIT -IV

Arrays – Concepts, using arrays in C, arrays and functions, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

UNIT - V

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, void pointer, null pointer.

Pointer Applications - Arrays and Pointers, Pointer Arithmetic and arrays, passing an array to a function.

Memory allocation functions **–** malloc(), calloc(), realloc(), free().

Array of pointers, pointers to functions, C program examples.

Text books:

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Thompson Learning, 2007 reprint

Reference books:

1. Raptor-A flow charting Tool http://raptor.martincarlisle.com
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
3. Programming in C. P. Dey and M Ghosh , Oxford University Press.
4. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
5. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.

16ME1101 - ENGINEERING DRAWING

I Year B Tech. I Sem

L	T	P/D	C
2	-	-/3	4

Prerequisite(s): None

Course Objectives

Develop ability to

1. Visualize and communicate all engineering elements and understand various concepts such as dimensions, conventions and standards related to working drawings.
2. Understand the fundamentals of geometrical curves and their applications in engineering.
3. Visualize different positions of planes and solids.
4. Visualize various isometric views and their applications in engineering.
5. Understand multi-view representations and their conversion into pictorial views and vice versa.

Course Outcomes (COs)

After the completion of the course, student would be able to

CO1: Visualize and communicate all engineering elements and represent the same using standard dimensions and conventions related to working drawings used in engineering practice.

CO2: Comprehend concepts of all 2D elements such as Conic Sections and 3D Objects namely, Prisms, Cylinders, Pyramids and Cones.

CO3: Draw orthographic projections of straight lines, planes and solids of given engineering components.

CO4: Construct isometric scale, isometric projections and views of given engineering components.

CO5: Visualize multi-view representations and its conversion into pictorial views and vice versa.

UNIT-I

Introduction to engineering drawing & Importance of engineering drawing:

Principles of Engineering Drawing, Various Drawing Instruments., Lettering &dimensioning, BIS standards, Title block, Geometrical constructions, Bisecting a line, arc and angle, Dividing straight line in to equal number of parts, Tangents to circles and arcs, Construction of pentagon, hexagon, inscribing circles inside regular polygons and vice versa etc.,

Curves:

Constructions of curves used in engineering practice: Conic sections including rectangular hyperbola - General method only, Cycloid, Epi-cycloid, Hypocycloid and Involutes.

Scales: Construction of different types of scales - Plain scale, Diagonal scale, vernier scale

UNIT-II

Introduction to Orthographic projections: conventions-first and third angle projections.

Projections of points: in all four quadrants.

Projections of straight lines: lines in simple position, inclined to one plane and parallel to other plane.

Projections of straight lines: Line inclined to both the planes.

UNIT-III

Projections of planes: planes in simple position, plane inclined to one plane and perpendicular to other plane, plane inclined to both the planes.

Projections of solids: (Cube, tetrahedron, Cone, Cylinder, Regular Prisms and Pyramids): solids in simple position (Axis perpendicular to one plane)

UNIT-IV

Isometric projections: Principle of isometric projection - isometric scale - isometric views - conventions - plane figures. Simple and compound solids - isometric projection of objects having non-isometric lines.

UNIT-V

Transformation of projections: conversion of Isometric views to orthographic views. Conversion of orthographic views to Isometric views - simple objects.

Text Books:

1. Engineering Drawing – N.D. Bhatt, charotar publications.

2. Engineering Drawing- Basant Agrawal, TMH.

Reference Books:

1. Engineering Graphics- P I Varghese Tata McGraw Hill Education Pvt. Ltd.

2. Engineering Drawing – P.J. Shah .S.Chand Publishers.

3. Engineering Drawing- Johle/Tata Mcgraw Hill Book Publishers.

4. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.

5 .Engineering Drawing - K.Venu Gopal & V.Prabu Raja New Age Publications.

6. Engineering Drawing - John. PHI Learning Publisher.

16EN11L1 - ENGLISH - I LAB

I Year B.Tech. I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course Objectives

Develop Ability to

1. Use Computer-aided Multimedia learning tool for individual language learning.
2. Sensitize student to the nuances of English speech sounds, accent, intonation and rhythm.
3. Listen actively and speak with intelligibility.
4. Apply language skills in real life situations.

Course Outcomes

At the end of the course, student would be able to

CO 1. Demonstrate the nuances of language through audio-visual tools during presentation.
CO 2. Demonstrate good writing skills.
CO 3. Speak intelligibly.
CO 4. Practice usage of International Phonetic Alphabet.

Module: 1
Ice Breaking Activities, JAM
Module: 2
Speech sounds, Neutralization of Mother Tongue Influence and Conversation Practice
Module: 3
Syllables, Stress, Intonation
Module: 4
Listening Activities (Only for demonstrative purposes)
Module: 5
Situational Dialogues and Role Play
Module: 6
Information Transfer
Additional Topics
Stress Management
Negotiation Skills

Books Recommended

1. Speaking English Effectively 2nd Edition by Krishna Mohan and N.P.Singh, MacMillan Publishers, 2011.

2. How to prepare for interviews by Shashi Kumar.V and Dhamija P.V
3. English Pronunciation in Use by Hancock, M. 2009, Cambridge University Press
4. Spoken English, a Manual of Speech and Phonetics by R.K.Bansal and J.B.Harrison, Orient Black Swan 2013.
5. Spoken English CDs by Shashi Kumar and Dhamija.
6. A Manual entitled English Language Communication Skills Lab Manual cum Workbook by Cengage Learning India 2013
7. GCET ELCS Lab Workbook.

16CH11L1 - ENGINEERING CHEMISTRY LAB

I Year B.Tech. I Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): None

COURSE OBJECTIVES:

Develop ability to

1. Understand the preparation of compounds namely, Aspirin and Biodiesel.
2. Use instrumental methods namely, Potentiometry, Conductometry and Colorimetry to find the concentration of a given solution.
3. Experimentally determine the physical constants namely, viscosity and surface tension of a given liquid using Ostwald's Viscometer and Stalagmometer respectively.
4. Use EDTA method to find the hardness of water, estimate chlorides in hard water by precipitation Titration,ferrous iron in water by Dichrometry and iodine in different salts using Iodometry.
5. Understand the preparation of Oil of Winter green.
6. Experimentally determine ferrous iron in cement by Colorimetric method.

COURSE OUTCOMES:

At the end of the course, student would be able to

CO 1. Employ the techniques which are fundamental in the preparation of Aspirin, Biodiesel and Oil of Winter Green.

CO 2. Use various instrumental methods in volumetric analysis namely, Potentiometry, and Conductometry to determine the concentration of a given solution.

CO 3. Use various titration methods namely, EDTA, Precipitation, Iodometry, and Dichrometry for estimating different chemical compounds/ions present in various samples.

CO 4. Estimate the concentration of a coloured compound using the technique of Colorimetry.

CO 5. Experimentally determine the physical properties of liquids such as viscosity and surface tension.

Any ten of the following twelve experiments must be conducted.

List of experiments

I. Preparation of compounds

1. Preparation of Aspirin
2. Preparation of Biodiesel

II. Instrumental Methods

A. Potentiometry

3. Titration of Strong acid vs Strong base by Potentiometry.
4. Titration of Weak acid vs Strong base by Potentiometry.

B. Conductometry

5. Titration of Strong acid vs Strong base by Conductometry.

C. Colorimetry

6. Estimation of Copper by Colorimetric method.

III. Physical Constants

7. Determination of Viscosity of given liquid by Ostwald's Viscometer.
8. Determination of Surface tension of given liquid by Stalagmometer.

IV. Titrimetry

9. Estimation of Hardness of water by EDTA method.
10. Estimation of Chlorides in hard water by Precipitation Method.
11. Estimation of Ferrous Iron in water by Dichrometry.
12. Estimation of Iodine in different salts using Iodometry.

Additional Experiments

1. Preparation of Oil of Winter green.
2. Determination of Ferrous iron in cement by Colorimetric method.

16CS11L1 - COMPUTER PROGRAMMING - I LAB

I Year B.Tech. I Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): None

Course objectives:

Develop ability to

1. Understand the intricacies of program development and problem solving techniques using Raptor tool
2. Understand the structure of a C- language program, list, describe, classify the C data types, input and output concepts as they apply to programs in C
3. Describe the expression types, understand the rules of precedence and associativity in evaluating the expressions
4. Understand how a C program evaluates logical and repetitive (loop) statements
5. Describe the importance of modularity and design multi-function program
6. Understand the basic concepts and uses of arrays using C language program
7. Understand the concept and the use of pointers for memory management techniques

Course outcome:

After completion of the course, student would be able to

CO 1. Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool
CO 2. Incorporate the concept of variables, constants and basic data types in a C language program
CO 3. Use simple input and output statements in a C language program
CO 4. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language
CO 5. Demonstrate an understanding of structure design by implementing programs with functions and passing of parameters to solve more complex problems
CO 6. Implement C programs using arrays
CO 7. Write and execute programs that access and manage data through pointers

LIST OF EXPERIMENTS	
1.	Introduction to RAPTOR Tool Draw Flow chart using RAPTOR for, a. Read a number and Display the same number b. Read and Display the student details c. Read two numbers from user and calculate addition and subtraction of those numbers d. Read two numbers from user at the time of execution and calculate multiplication and division of those numbers e. Find the square of a given number (take the number from the user) f. Calculate the value of Y from the equation y = x2 + 2x + 3 (read the value of X

	from user)
2.	Draw Flow chart using RAPTOR for, a. Calculate the area of a Circle b. Calculate the area of a Square c. Calculate the area of a Rectangle d. Interchange two numbers e. Find the sum of square of two numbers f. Convert Centigrade to Fahrenheit g. Convert Radius to Degrees h. Display the roots of Quadratic Equation
3	Draw Flow chart using RAPTOR for, 1. Check the given number is Positive or Negative 2. Check the given number is even or odd 3. Display whether a person is eligible for vote or not 4. Calculate the Largest of two numbers 5. Check the given year is leap year or not 6. Check whether two numbers are equal or not 7. Find the largest value among three given numbers
4	Draw Flow chart using RAPTOR for, 1. Calculate and display the grade of a student i. < 30 % - Fail ii. Between 31 and 50 – C grade iii. Between 51 to 60 – B grade iv. Between 61 to 75 – A grade v. Greater than 75 - distinction 2. Find the quadratic roots of an equation (real or imaginary) 3. Check the given number is multiple of 2,4and 8
5	Draw Flow chart using RAPTOR for, 1. Display n numbers using looping 2. Calculate the sum of n natural numbers 3. Display the even numbers below n 4. Calculate sum of even numbers and odd numbers from 1 to n (n value supplied by the user)
6	1. Write a C program to display student details 2. Write a C program to perform arithmetic operations 3. Write a C program to implement increment and decrement operators 4. Write a C program to implement conditional operator 5. Write a C program to implement bit wise operator
7	1. Write a C program to calculate the biggest of given two numbers 2. Write a C Program to print the result depending on the following i. < 30 % - Fail ii. Between 31 and 50 – C grade

	iii. Between 51 to 60 – B grade iv. Between 61 to 75 – A grade 3. Write a C Program to implement arithmetic calculator using switch case
8	1. Write a C program to find sum of n natural numbers 2. Write a C program to find individual digits of the given number 3. Write a C program to find factorial of a given number
9	1. Write a C program to display the prime numbers below n (where n value is given by user) 2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. 3. Write a C program to generate the first n terms of the sequence. 4. Write a C program to find the quadratic roots of an equations 5. Write a c program to calculate sum of the following geometric equation $Sum=1+x+x^2+x^3+\ldots.+x^n$
10	a. Write a C program to find the given number is palindrome or not b. Write a C program to find GCD and LCM of two given numbers using functions c. Write a C program to find the factorial of a given number using recursive function d. Write a C program to generate the fibonacci series using recursive function
11	e. Write a c program to find largest and smallest numbers in a list of array elements using functions f. Write a C program to sort the given list of elements in ascending order using functions. g. Write a c program to search for a given element in the list of array and display the "location" if the number is found else print "the number is not found". i. Using fixed length array ii. Using variable length array.

12	1. Find the duplicate elements in the list of sorted array 2. Write a C program that uses functions to perform the Addition of Two Matrices 3. Write a C program that uses functions to perform the Multiplication of Two Matrices
13	1. Write a C program to swap two integers using following methods i. call by value ii. call by reference 2. Write a C program to find sum of even and odd numbers using functions and pointers
14	1. Write a C program to find Largest Number Using Dynamic Memory Allocation. 2. Write a C program to return multiples values from a function using pointers

16EN1201 – ENGLISH- II

L	T	P/D	C
2	-	-/-	2

I Year B.Tech. II Sem

Prerequisite(s): 16EN1101 – English- I

Course Objectives

Develop ability to

1. Function in multidisciplinary teams.
2. Understand professional and ethical responsibility.
3. Apply strategies and inculcate life skills.

Course Outcomes

At the end of the course the learners would be able to:

1. Acquire interpersonal and life skills
2. Demonstrate professional ethics and etiquette
3. Demonstrate application of various strategies to real-life situations.

UNIT-I

Writing	Steps in Writing Process Cover letter and Job Application, Letter CurriculumVitae Résumé Abstract Writing and Responding to a blog

UNIT-II

Reading	1*)Mokshagundam Visvesvaraya* *2) The Palm Islands*
Vocabulary	Prefixes and Suffixes
Grammar	Joining ideas using conjunctions, Adverbs
Speaking	Opinion-based questions
Writing	Summarizing

UNIT-III

Reading	*1)Leela's Friend* by R.K.Narayan 2*)Forensic Science*
Vocabulary	Guessing the words, Using the Appropriate word, Phrasal verbs
Grammar	Knowing with questions
Speaking	Presentation
Writing	Report Writing

UNIT-IV

Reading	*1)The Last Leaf* by O.Henry 2)*Chose how to start your day*
Vocabulary	Idioms
Grammar	Relating objects by using prepositions, Ergative verbs
Speaking	Creative Speaking Activity
Writing	Technical Report Writing

UNIT-V

Reading	*1)Indian Crowds* by Nirad C.Chaudhuri 2)*Snippets that focus on cultural differences among the people*
Vocabulary	One-Word Substitutes (related to the lesson)
Grammar	Synthesis of Sentences
Speaking	Activity on Indo-American Cultural Differences
Writing	Day to day-experiences of students while travelling

Text Books:

1. Epitome of Wisdom published by Orient Longman
2. A Passage to England by Nirad C. Chaudhuri

Recommended Books:

1. Contemporary English Grammar Structures and Composition by David Green, Macmillan Publishers 2010, New Delhi
2. Innovate with English: A Course in English for Engineering Students by T Samson, Foundation Books
3. English Grammar Practice by Raj N Bakshi, Orient Longman
4. English Pronunciation in Use by Hancock, M. 2009, Cambridge University Press
5. Technical Communication by Meenakshi Raman, Oxford University Press
6. Grammar Games by Renuvolcuri Mario, Cambridge University Press
7. Enrich Your English by Thakur K.B.P. Sinha, Vijay Nicole Imprints Pvt.Ltd

16PH1201 - APPLIED PHYSICS

I Year B.Tech. II Sem

L	T	P/D	C
4	1	-/-	4

Prerequisite(s): 16PH1101 – ENGINEERING PHYSICS

Course Objectives:

Develop ability to

1. Understand the concept of matter wave, application of Schrodinger wave equation and density of energy states.
2. Discuss the formation of energy bands in solids, classification of solids, and find the carrier concentration in intrinsic and extrinsic semiconductors, understand the concept of Fermi level and Hall Effect.
3. Analyze p-n junction diode and its load line characteristics; understand breakdown mechanisms in semiconductor diodes.
4. Understand the functioning of rectifiers and filters; functioning of zener diode as a voltage regulating device.
5. Understand the principle of optical fiber communication; distinguish various types of optical fibers and their applications.

Course Outcomes:

After completion of the course, student would be able to

CO 1. Explain wave nature of matter, Distinguish between various energy distributions; evaluate Fermi energy using density of states.

CO 2. Distinguish between conductors, semiconductors and insulators, carrier concentration in intrinsic and extrinsic semiconductors; identify the type of extrinsic semiconductor through Hall Effect.

CO 3. Analyze V-I characteristics of p-n junction diode and its cut -in voltage.

CO 4. Explain working of half wave and full wave rectifiers, filters and their applications.

CO 5. Explain modes of propagation, attenuation in optical fibers and the applications of optical fibers in communication, sensors and detectors.

UNIT I

Quantum Mechanics

Origin of Quantum mechanics, de-Broglie hypothesis, matter waves, Davisson and Germer's experiment, concept of wave packet, group velocity, phase velocity, Heisenberg's uncertainty principle and its consequences, one dimensional time independent Schrodinger wave equation, physical significance of wave function, particle in one dimensional potential box. Quantum tunneling (Qualitative treatment), Maxwell Boltzmann, Bose Einstein & Fermi Dirac statistics (qualitative), Density of states.

UNIT II

Band theory of solids and semiconductors

Electron in a periodic potential, Bloch theorem, Kronig-Penny Model (Qualitative Treatment), Brillouin Zones (E-K curve), origin of energy band formation in solids, concept of effective mass of an electron, classification of materials into conductors, semiconductors & insulators.

classification of extrinsic semiconductors, Fermi level in Intrinsic and Extrinsic semiconductors, variation of Fermi level with temperature and concentration of dopants in extrinsic semiconductors, calculation of carrier concentration in Intrinsic & Extrinsic semiconductors, equation of continuity, Direct and Indirect Band gap semiconductors, Hall effect.

UNIT III

p-n junction diode

Qualitative theory of p-n junction, energy level diagram of p-n junction in forward & reverse bias condition, p-n junction as a diode, diode equation, volt-ampere characteristics, temperature dependance of V-I characteristics, ideal versus practical – Resistance levels (Static and Dynamic), Transition and Diffusion capacitances, diode equivalent circuits, load line analysis, breakdown mechanisms in semiconductor diodes, Zener diode characteristics.

UNIT IV

Rectifiers and Filters

P-N junction as a rectifier, half wave rectifier, full wave rectifier, bridge rectifier, harmonic components in a rectifier circuit, Inductor filters, capacitor filters, L- section filters, π- section filters, comparison of filters, voltage regulation using Zener diode.

UNIT V

Fiber optics

Principle of an optical fiber, construction of an optical fiber, acceptance angle and acceptance cone, numerical aperture, types of optical fibers, modes of propagation, attenuation in optical fibers, block diagram of optical fiber communication system, applications of optical fibers in sensors and detectors (displacement, smoke and liquid level detectors).

Text Books:

1. Millman's Electronic devices & Circuits, , Jacob Millman, Christos C Halkias, Satyabrata Jit 3rd edition, Mc Graw Hill
2. Engineering Physics, K. Malik, A. K. Singh, Tata Mc Graw Hill.

Reference Books:

1. Electronic devices & Circuits, S Salivahanan, N Srushkumar, A Vallava Raj, Second edition, Tata Mc Graw Hill Book Publishers.
2. Fundamentals of Physics, David Halliday, John Weily Publishers.
3. University Physics, Sear's and Zemansky (10th Edition), Wesly Publishers.
4. Modern Physics, R. Murugesan, S Chand & Co Publishers (For Statistical Mechanics)
5. Fiber optic communication, Gerd Keiser., Tata Mc Graw Hill Book Publishers.
6. Engineering Physics, V. Rajendran, Tata Mc Graw Hill Book Publishers.

16MA1201–MATHEMATICS – II

I Year B.Tech. II Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16MA1101 - Mathematics-I

Course Objectives:

Develop ability to

1. Identify the methods of differential calculus to optimize single and multivariable functions.
2. Evaluate improper integrals using Beta and Gamma functions.
3. Evaluate multiple integrals and apply the same to solve engineering problems.
4. Understand convergence of the series using Fourier series technique and to find solution of integral equations using Fourier Transforms.
5. Explain properties of vector operators. Use vector calculus to determine the length of a curve, area between surfaces and volume of solids.

Course Outcomes:

At the end of the course, the students would be able to:

CO 1. Apply the methods of differential calculus to optimize single and multivariable functions.
CO 2. Evaluate improper integrals using Beta and Gamma functions.
CO 3. Evaluate multiple integrals and apply the concepts of the same to find areas, volumes and moment of inertia of regions on a plane or in space.
CO 4. Apply Fourier series to find convergence of series and Fourier Transforms to solve integral equations.
CO 5. Apply vector operators on scalar and vector point functions to compute length of a curve, area between surfaces and volume of solids, using vector calculus.

UNIT-I

Functions of Several Variables

Limit, Continuity, Partial Differentiation, Total Derivatives, Functions of several variables- Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers

UNIT-II

Improper Integration

Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.

UNIT-III

Multiple Integration and its Applications

Multiple integrals – double and triple integrals – change of order of integration- change of variables (polar, cylindrical and spherical), Finding the area of a region using double integration and volume of a region in space using triple integration.

UNIT – IV

Fourier series and Transforms

Definition of periodic function, Fourier expansion of periodic functions in a given interval of length 2π. Determination of Fourier coefficients–Fourier series of even and odd functions–Fourier series in an arbitrary interval –even and odd periodic continuation – Half-range Fourier sine and cosine expansions, Fourier integral theorem –Fourier sine and cosine integrals, Fourier Integral transforms–Fourier sine and cosine transforms and their properties–inverse transforms–Finite Fourier transforms

UNIT –V

Vector Calculus

Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties, - Laplacian operator- Solenoidal and irrotational vectors, Scalar Potential function, directional derivatives. Line integral – work done – Surface integrals -Volume integral. Green's theorem, Stoke's theorem and Gauss's Divergence theorems (Statement & their Verification).

Text Books:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa publishing House, Delhi.

Reference Books:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
2. Engineering Mathematics by Srimanta pal, subhodh C.Bhunia, Oxford higher Education.
3. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC
4. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education
5. Ordinary & Partial Differential Equations, M D Raisinghania, S. Chand.

16MA1202–MATHEMATICS – III

I Year B.Tech. II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): 16MA1101 - Mathematics-I

Course Objectives:

Develop ability to

1. Understand approximation of a polynomial/curve to satisfy the given set of data.
2. Determine approximate zeros of an algebraic/transcendental/system of equations using suitable numerical methods.
3. Evaluate differentiation/integration methods for a given set of data using numerical methods.
4. Apply various numerical methods to compute approximate solution of a given ordinary differential equation with initial conditions.
5. Apply Partial Differential Equations to solve problems in one dimensional heat and wave equations.

Course Outcomes:

At the end of the course, the student would be able to:

CO 1. Approximate a polynomial/curve to satisfy the given set of data.

CO 2. Apply suitable numerical methods to find the approximate root/solution of algebraic/transcendental/system of equations.

CO 3. Apply various numerical methods to evaluate differentiation/integration for a given set of data.

CO 4. Solve a given ordinary differential equation with initial conditions using suitable numerical methods.

CO 5. Apply partial differential equations to solve problems namely, one dimensional wave equation and heat equation.

UNIT – I

Interpolation and Curve fitting

Interpolation: Introduction-Errors in polynomial Interpolation - Finite Differences - Forward Differences - Backward Differences - Central Differences - Symbolic relations and separation of symbols - Difference Equations - Differences of a polynomial - Newton's formulae for interpolation-interpolation with unevenly spaced points-Lagrange's interpolation formula.

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

UNIT – II

Root finding Methods

Solution of Algebraic and Transcendental Equations and Linear system of equations, Introduction – Graphical interpretation of solution of equations, The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method, Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method)Jacobi's and Gauss Seidel Iteration method.

UNIT – III

Numerical Differentiation, Integration

Numerical differentiation: Newton's forward and backward difference derivatives, Stirling's Central difference derivatives, Numerical integration – General quadrature formula, Trapezoidal rule, Simpson's $1/3^{rd}$and $3/8^{th}$ Rule.

UNIT – IV

Numerical solutions of First order differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series method – Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge - Kutta Methods.

UNIT – V

Partial Differential Equations

Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation, Method of separation of variables for second order equations –Applications of Partial differential equations- one dimensional wave equation, one dimensional Heat equation.

Text Books:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

Reference Books:

1. Computer Oriented Numerical Methods by V. Rajaraman, PHI Learning.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
3. Engineering Mathematics by Srimanta pal, subhodh C.Bhunia, Oxford higher Education.
4. A text book of Higher Engineering Mathematics, Bali N P and Saxena, Lakshmi Publications.
5. Introductory methods of Numerical Analysis by S.S. Sastry, PHI learning.

16CS1201 – COMPUTER PROGRAMMING - II

I Year B.Tech. II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): 16CS1101 Computer Programming-I

Course Objectives

Develop ability to:

1. Understand the concepts of String Manipulation Functions using C language in programming.
2. Introduce the structure, union, and enumerated types
3. Understand the classical approaches to sorting arrays: selection, bubble, insertion, merge sorting; sequential and binary searching algorithms.
4. Introduce the basic concepts of lists, stacks and queues and their applications.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams.

Course Outcomes

After completion of the course, students would be able to:

CO1. Write and execute programs that read, write and manipulate strings using C language program.

CO2. Use the type definition, enumerated types, define and use structures, unions in programs using C language.

CO3. Write programs that sort data using selection, bubble, insertion techniques and perform search mechanisms either by sequential or binary search techniques using C language program.

CO4. Demonstrate the basic operations of stacks and queues using C program.

CO5. Write programs that read and write text, binary files using the formatting and character I/O functions.

UNIT – I

Strings – Concepts, C Strings, String Input / Output functions, string manipulation functions, arrays of strings, string / data conversion, C program examples.
Enumerated – The Type Definition (typedef), Enumerated types
Preprocessor commands: C program examples.

UNIT – II

Structure and Union Types

Structures – Declaration, initialization, accessing structures, operations on structures, Complex structures, C program examples.

Structures in C:
Structures and functions, passing structures through pointers, self referential structures, unions, bit fields, C programming examples

UNIT – III
Sorting - Selection sort, bubble sort, insertion sort and merge sort techniques (Using Arrays)
Searching - Linear search, binary search, binary recursive search techniques (Using Arrays)

UNIT - IV
Linear list - Singly linked list implementation, insertion, deletion and searching operations on linear list
Stacks - Push and Pop Operations, Introduction to In-fix and Post-Fix Notation. (Arrays and List implementation.)
Queues - Enqueue and Dequeue operations. (Arrays and List implementation.)

UNIT – V
File Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions, C program examples.
Command line arguments, C program examples.
Program Development – Simple file, Multi-function, Multi-source files, Separate Compilation of functions

TEXT BOOK(S)
1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Thompson Learning,2007,reprint

REFERENCE BOOK(S)
1. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.
3. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
4. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
5. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.

16EN12L1 – ENGLISH - II LAB

L	T	P/D	C
-	-	2/-	1

I Year B.Tech. II Sem

Prerequisite(s): 16EN1101 – English –I
16EN11L1 – English – I Lab

Course Objectives

Develop ability to

1. Use Computer Aided Multimedia tools for advanced language learning.
2. Sensitize student to the nuances of combination of speech sounds, accent, intonation and rhythm of English language.
3. Listen actively and speak fluently at various fora.
4. Apply language skills with ease in real life situations.
5. Enhance writing skills.

Course Outcomes

At the end of the course, student would be able to

CO 1. Demonstrate with ease the nuances of English language through audio-visual tools.
CO 2. Listen actively and speak fluently at various fora.
CO 3. Demonstrate language skills aptly in various situations.
CO 4. Demonstrate writing skills with appropriate usage of words.

Module: 1
Consonant Clusters, Past Tense and Plural Markers, Minimal Pairs
Module: 2
Describing people, places, situations – Narrating- Giving Directions
Module: 3
Discussions and Public Speaking
Module: 4
Debate
Module: 5
Oral Presentations
Module: 6
Creative Writing
Additional Topics
Assertive Communication
Time Management

Books Recommended

1. Speaking English Effectively 2nd Edition by Krishna Mohan and N.P.Singh, MacMillan Publishers, 2011.
2. How to prepare for interviews by Shashi Kumar.V and Dhamija P.V
3. English Pronunciation in Use by Hancock, M. 2009, Cambridge University Press
4. Spoken English, a Manual of Speech and Phonetics by R.K.Bansal and J.B.Harrison, Orient Black Swan 2013.
5. Spoken English by Shashi Kumar and Dhamija.
6. A Manual entitled English Language Communication Skills Lab Manual cum Workbook by Cengage Learning India 2013
7. Creative Writing Skills by Ashraf Rizvi, Tata Mc. Graw Hill
8. CD's on listening.

16PH12L1 – APPLIED PHYSICS LAB

L	T	P/D	C
-	-	3/-	2

I Year B.Tech. II Sem

Prerequisite(s): 16PH1101 – ENGINEERING PHYSICS

Course Objectives:

Develop ability to

1. Determine of modulii of elasticity.
2. Determine the magnetic induction at several points on the axis of coil carrying current using Stewart and Gee's method, time constant of a capacitor and the resonant frequency and quality factor of a LCR circuit.
3. Determine energy gap of a given semiconductor,
4. Determine wavelength of spectral lines in Mercury spectrum, wavelength of LASER, and radius of curvature of a plano-convex lens; find numerical aperture and bending losses in an optical fiber.
5. Study V-I characteristics of p-n junction and Zener diode; calculate ripple factor of a given rectifier.
6. Plot input and output characteristics of a given transistor in CE configuration, plot the V-I characteristics of solar cell

Course Outcomes:

After completion of the course, student would be able to

CO 1. Infer Modulii of elasticity of given material, compute shearing stress and strain: identify their limitations.

CO 2. Compute the magnetic induction using Stewart and Gee's method; explain the signal delay in electronic circuits by calculating time constant of a capacitor; Determine the resonant frequency and quality factor of a LCR circuit

CO 3. Demonstrate the optical phenomena like interference and diffraction by computing wavelength of spectral lines of a given source. Compute light gathering capacity and bending losses in an optical fiber.

CO 4. Plot the V-I characteristics of p-n junction diode and zener diode, Compute ripple factor of a given rectifier.

CO 5. Obtain the V-I characteristics of solar cells and specify their applications; Evaluate current gain of a given transistor

List of Experiments:

(Any ten of the following twelve experiments compulsory)

1. Determination of the Rigidity Modulus of a given wire using Torsional Pendulum.
2. Determination of magnetic field of Induction at several points on the axis of a circular coil carrying current using Stewart and Gee's method.
3. Determination of Time constant of a given RC Circuit.
4. To study the frequency response of LCR series circuit and to find the resonant frequency and quality factor.
5. Determination of radius of curvature of a given Plano Convex lens by forming Newton's Rings.
6. Determination of wavelength of spectral lines of mercury spectrum - Diffraction grating
7. Determination of Wavelength of a given source of LASER-Diffraction Grating.
8. Determination of Numerical aperture and bending losses of a given Optical fiber cable.
9. Determination of Energy gap of a given semiconductor.
10. V-I Characteristics of p - n junction diode.
11. Conversion of ac to dc by using Half wave and Full wave rectifier with and without filters.
12. Zener diode characteristics and Zener diode as voltage regulator.

Additional Experiments:

1. V-I characteristics of Solar cell.
2. Input and Output Characteristics of a given Transistor - CE configuration.

16MA12L1–COMPUTATIONL MATHEMATICS LAB

I Year B.Tech. II Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): 16CS1101 - Computer Programming - I

Course Objectives:

Develop ability to write and execute programs using C-programming/octave/Scilab to

1. Find the solution of system of non-homogeneous equations by L-U decomposition method
2. Construct a polynomial of suitable degree by using the discrete data.
3. Find the numerical solutions of ordinary differential equations using different numerical methods like Taylor's series method, Picard's method, Euler's method, Euler's modified method and Runge-Kutta method, when the usual methods fail to find the general solution of a differential equation.
4. Apply numerical integration methods to find integration of unintegrable functions.

Course Outcomes:

At the end of the course, the student would be able to:

CO 1. Determine the solution of system of non-homogeneous equations by L-U decomposition method.

CO 2. Construct a polynomial of suitable degree by using the discrete data

CO 3. Apply Numerical differentiation techniques to find first, second and higher order derivatives, when the function under consideration is not differentiable

CO 4. Determine the numerical solutions of ordinary differential equations using different numerical methods like Taylor's series method, Picard's method, Euler's method, Euler's modified method and Runge-Kutta method, when usual methods fail to find the general solution of differential equation.

Programming Tasks:

1. Determine y for a given x, if two arrays of x and y of same size are given (using Newton's interpolation both forward and backward).
2. Determine y for a given x, if two arrays of x and y of same size are given(using Lagrange's and Gauss's interpolation)
3. Find the solution of given system of linear equations using L-U decomposition method.
4. Find the solution of given system of linear equations using Jacobi's method.
5. Find the solution of given system of equations using Gauss-seidel iteration method.
6. Find the solution of given system of equations using Gauss Jordan elimination method.
7. Evaluate definite integral using trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.

8. Solve a given differential equation using Taylor's series.
9. Solve a given differential equation using Euler's and modified Euler's method.
10. Solve a given differential equation using Runge-Kutta method.

Advance Lab techniques:

1. Solve system of equations using QR-algorithm.
2. Solve system of equations using Predictor-Corrector algorithm.

16CS12L1 - COMPUTER PROGRAMMING - II LAB

L	T	P/D	C
-	-	3/-	2

I Year B.Tech. II Sem

Prerequisite(s): 16CS1101 Computer Programming I
16CS11L1 Computer Programming Lab I

Corse objectives:

Develop ability to:

1. Understand the concepts of string manipulation functions using C language in programming
2. Introduce the structure, union and enumerated types
3. Understand the classical approaches to sorting arrays: selection, bubble, insertion, merge sorting, sequential and binary searching algorithms
4. Understand the basic concepts of lists, stacks, queues and their applications
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams

Course outcome:

After completion of the course, student would be able to

CO 1. Write and execute programs that read, write and manipulate strings using c language program
CO 2. Use the type of definition, enumerated types, define and use structures, unions in programs using C language
CO 3. Write programs that sort data using selection, bubble, insertion techniques and perform search mechanisms either by sequential or binary search techniques using C language program
CO 4. Demonstrate the basic operations of stacks and queues using C program
CO 5. Write programs that read and write text, binary files using the formatting and character I/O functions

Week No	Name of the program
1	1. Write a C program to find weather a given string is palindrome or not. 2. Write a C program to insert characters at a given location in a given string. 3. Write a C program to delete characters from a given string and position 4. Write a C program to print the number of vowels and consonants using Strings.
2	1. Write a C program to convert Roman number to Decimal Number. 2. Write a C program to find the 2's Compliment of a given string 3. Write a C program to Reverse a String by Passing it to function 4. C Program to Input a String with at least one Number, Print the Square of all

	the Numbers in a String
3	1. Write a c program to implement complex structures for the following operations. i. Addition of 2 Complex numbers ii. Multiplication of 2 Complex Numbers
4	1. Write a c program to implement arrays of structures? 2. Write a c program to implement bit fields in C?
5	1. Write a C Program to store the information (name, roll no, and branch) of a student using unions. 2. Write a c program to implement inter function communication by passing pointers to a structure.
6	1. Write a c program to sort the elements using selection sort 2. Write a c program to sort the elements using Bubble sort. 3. Write a c program to sort the elements using Insertion sort 4. Write a c program to sort the elements using Merge sort
7	1. Write a c program to search an element in a list of elements using linear search. If the element found display the position, otherwise print "element not present". 2. Write a c program to search an element in a list of elements using Binary search. If the element found display the position, otherwise print "element not present". 3. Write a c program to search an element in a list of elements using recursive Binary search. If the element found display the position, otherwise print "element not present".
8	Write a c program to implement singly linked list for the following operations. a) Insertion b)Deletion c)Search
9	1. Write a c program implement Stack using arrays. 2. Write a c program implement Stack using linked list. 3. Write a c program convert infix to postfix notation.
10	1. Write a c program implement Queue using arrays for the following operations. i) Enqueue ii) Dequeue 2. Write a c program implement Queue using Linked list for the following operations. i) Enqueue ii) Dequeue
11	1. Write a c program open a new file and implement the following I/O functions. i. fprintf(), fscanf() ii. getw(), putw() iii. getc(), putc() 2. Write a c program to copy data from one file to another. 3. Write a c program to merge two files, using command line arguments.

16WS12L1 – INFORMATION TECHNOLOGY WORKSHOP (ITWS) / ENGINEERING WORKSHOP (EWS)

I Year B.Tech. II Sem

L	T	P/D	C
-	-	3/-	2

INFORMATION TECHNOLOGY WORKSHOP (ITWS)

Prerequisite(s): None

Course Objectives

Develop ability to

1. Identify different components of Personal Computer (PC) and their configurations.
2. Identify various steps for disassembly and assembly of PC components.
3. Install Windows and Linux operating systems on Personal Computers.
4. Troubleshoot simple hardware and software related problems.
5. Make Text Documents using various features of document preparation tools such as MS-Word, Libre Office Write, LaTex.
6. Make Spread Sheet using various features of worksheet preparation tools namely, MS-Excel, Libre Office Calc.
7. Make Presentations using various features of presentation tools namely, MS-Powerpoint, Libre Office Express.

Course Outcomes

After completion of the course, student would be able to:

CO1. Identify the components of Personal Computer (PC) System.

CO2. Disassemble and assemble the components of Personal Computer.

CO3. Troubleshoot trivial hardware and software related problems.

CO4. Use productivity software such as MS Office Tools: Word, Excel, Power Point, Libre Office Tools: Write, Calc, Express and LaTex.

CO5. Install Operating Systems such as Windows and Linux on personal computers

Week 1	**Task 1**: Different generations of computers, computing environments, Identify the peripherals of a computer, components in CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral. **Task 2**: The students need to go through the video which shows the process of assembling a PC. The student should disassemble and assemble the PC back to its working condition.
Week 2	**Task 1:** Every student should learn installing Windows-7 in the personal computer.

	Task 2: Hardware & software Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals and Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.
Week 3	**Task**: Every student should learn the process of installing Linux in the computer along with configuring as dual boot with both windows and Linux.
Week 4	**Task 1**: Features of Word Processor Tool: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track changes. **Task 2**: Creating a Newsletter: Features: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge.
Week 5	**Task 1**: Features of Spreadsheet Tool: Creating a Scheduler - Features:- Gridlines, Format Cells, Summation, auto fill, Formatting Text **Task 2**: Calculating GPA : Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, lookup, Sorting, Conditional formatting.
Week 6	**Task**: Features of Presentation tool: Students will work on basic power point utilities and tools which help them to create power point presentation. Presentation Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts Lines and Arrows.
Week 7	**Task:** Document preparation using LaTex
Week 8	**Task:** Document, Spreadsheet and Presentation using Libre Office

TEXT BOOK(S)

1. Comdex Information Technology Course Tool Kit, Vikas Gupta, WILEY Dreamtech, 2009-10 Edition
2. Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education, 2012.

REFERENCE BOOK(S)

1. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.
2. LaTex Companion, Leslie Lamport, PHI/ Pearson.
3. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education.
4. IT Essentials PC Hardware and Software Companion Guide, Third Edition, David Anfinson and Ken Quamme, CISCO Press, Pearson Education.

ENGINEERING WORKSHOP (EWS)

Prerequisite(s): None

Course Objectives:

Develop ability to

1. Inculcate general machining skills.
2. Understand the dignity of labour, precision, safety at work place, team working and development of positive attitude.
3. Gain hands on experience on different trades of engineering such as fitting, carpentry, tin smithy, welding, foundry, black smithy, house wiring and sheet metal.
4. Acquire knowledge of thread cutting and pipe joining in plumbing.
5. Understand the concept of Machining with lathes and automats.
6. Be aware of power tools used in various Engineering applications.

Course Outcomes (COs)

After the completion of the course, student would be able to

CO 1. Use various modern engineering tools for engineering practice
CO 2. Recognize dignity of labour and workshop safety regulations.
CO 3. Design and model different prototypes in carpentry such as T-Lap Joint and L-Lap Joint. Make basic prototypes in Tin Smithy such as Open Scoop and Rectangular Tray.
CO 4. Perform basic House Wiring techniques such as Series wiring, Staircase (one lamp with two switches) Connection, Connecting one lamp with one switch, connecting two lamps with one switch.
CO 5. Design and model basic prototypes in fitting such as L-Fitting, V-Fitting and Dove tail Fitting.
CO 6. Make basic prototypes in Black Smithy such as S-Hook, C –Hook and Flat Chisel.
CO 7. Perform basic Foundry such as Dumbbell Pattern, Stepped Pulley Pattern and Gear Pattern
CO 8. Demonstrate knowledge of welding process, Plumbing and power Tools.

List of Experiments

I. TRADES FOR EXERCISES:

At least TWO exercises from each trade:

1. Carpentry

T-Lap Joint, L-Lap Joint, Cross Lap joint, Dove Tail Joint

2. Fitting

L-Fitting, V-Fitting,Dove tail Fitting.

3. Tin-smithy and development of jobs carried out and soldering.

Open Scoop, Rectangular Tray, Funnel.

4. House-wiring

Series Wiring, Staircase Wiring, Connecting one lamp with one switch, connecting two lamps with one switch.

5. Black smithy

S-Hook, C –Hook, Flat Chisel.

6. Foundry

Dumbbell Pattern, Stepped Pulley Pattern, Gear pattern

II. TRADES FOR DEMONSTRATION & EXPOSURE:

1. Welding

   V-Butt Joint, Corner Butt Joint, Lap Joints.

2. Power tools used in construction, wood working, electrical engineering and mechanical engineering.

3. Plumbing

Thread Cutting, Pipe Joining –1, Pipe Joining -2.

Text Books:

1. Work shop manual - P.Kannaiah/K.L Narayana/SciTech publishers.
2. Workshop manual by Venkat Reddy, 2nd Edn, SciTech publishers.

Reference books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
3. Jeyapoovan T.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

16MA2103–COMPLEX VARIABLES

II Year B.Tech. I Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16MA1201 - Mathematics-II

Course Objectives:

Develop ability to

1. Understand differences between real and complex valued functions and verify their analyticity.
2. Appreciate integrations of complex valued functions.
3. Express complex valued functions in terms of power series and test its convergence using complex integral theorems.
4. Understand residues and apply residue theorem to compute several kinds of real definite integrals.
5. Transform a given complex valued function from Z-plane to W-Plane using conformal, standard and bilinear transformations.

Course Outcomes:

At the end of the course, student would be able to:

CO 1: Determine analyticity of a given function using Cauchy-Riemann equations and find complex function for given real or imaginary parts.

CO 2: Apply Cauchy's theorem, Cauchy's integral formula including Generalized one to evaluate integration of complex valued functions.

CO 3: Use Maclaurin's and Laurent series to expand given complex valued functions and test its convergence.

CO 4: Compute several kinds of real definite integrals using residue theorem.

CO 5: Employ conformal, standard and bilinear transformations to transform a given complex valued function from Z-plane to W-Plane.

Unit-I

Complex Functions and Analyticity–Differentiation

Complex functions and its representation on Argand plane, Concepts of limit Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method.

Unit-II

Complex Integration

Line integral – Evaluation along a path and by indefinite integration – Cauchy's theorem – Cauchy's integral formula – Generalized Cauchy's integral formula.

Unit-III

Power series expansions of complex functions

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series, Singular point –Isolated singular point – pole of order m – essential singularity.

UNIT-IV

Contour Integration

Residue – Evaluation of residue by formula and by Laurent series. Residue theorem, Evaluation of integrals of the type (a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(cos\theta, sin\theta)\,d\theta$ (c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ (d) Integrals by indentation.

UNIT-V

Conformal mapping

Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like e^z, log z, z^2 , and Bilinear transformation, Properties of Bilinear transformation, determination of bilinear transformation when mappings of three points are given.

Text Books:

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Advanced Engineering Mathematics by R.K. Jain & S. R. K. Iyengar, Narosa Publishing House.

Reference Books:

1. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.
2. Complex analysis for Mathematics and Engineering by John H, Jones And Bartlett India Pvt Ltd. - New Delhi. 6th Edition
3. Foundations of Complex Analysis by S. Ponnuswamy, Narosa Publications
4. Engineering Mathematics by Srimanta pal, subhodh C.Bhunia, Oxford higher Education.
5. A Text Book of Engineering Mathematics by N P Bali, Manesh Goyal
6. Mathematics for Engineers by K. B. Datta and M.A S.Srinivas, Cengage Publications

16EC2101- ELECTRONIC DEVICES AND CIRCUITS

L	T	P/D	C
4	1	-/-	4

II Year B.Tech. I Sem

Prerequisite(s): 16PH1201-Applied Physics

Course objectives:

Develop ability to

1. Understand the principle of operation of various semiconductor devices - Bipolar Junction Transistor (BJT), Field Effect Transistor(FET) and their applications.
2. Learn various biasing circuits for BJT and FET.
3. Understand analysis of BJT, FET and MOSFET amplifier circuits at low frequencies.

Course outcomes:

At the end of the course, student would be able to:

CO 1. Analyze the applications of the p-n diode as rectifier and Zener diode as voltage regulator.
CO 2. Analyze the characteristics of BJT in CB, CE and CC configurations.
CO 3. Design and analyze the transistor biasing circuits for a given operating point.
CO 4. Design and analyze amplifiers at low frequencies using h parameter model.
CO 5. Analyse FET and MOSFET amplifiers at low frequencies.

UNIT –I

Review of p-n junction diode

Review of P-N Junction, Diode as rectifier, Various filters used in rectifiers and their comparison, Voltage regulation using Zener diode.

BJT characteristics

The Bipolar Junction Transistor, transistor current components, transistor construction, BJT operation, BJT symbol, Common Base, Common Emitter and Common Collector configurations, Regions of operation, limits of Operation, Early Effect, BJT specifications, Introduction to UJT and SCR.

UNIT –II

BJT biasing and stabilization

Operating Point, The DC and AC Load lines, need for biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector - Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in V_{BE} and β, Bias compensation using diodes and transistors, Thermal Runaway, Thermal stability and heat sinks.

UNIT –III

FET characteristics

The Junction Field Effect Transistor (construction, principle of operation and symbol), Pinch-off voltage - Volt-Ampere characteristics. The JFET small signal model (Construction, principle of operation, symbol and Characteristics). Enhancement and Depletion MOSFET.

UNIT –IV

BJT amplifiers

Transistor as an amplifier, Comparison of CB, CE, and CC amplifier configurations, BJT hybrid Model, determination of h-parameters from Transistor characteristics. Analysis of a transistor amplifier circuit using h-Parameters. Simplified hybrid model. Analysis of CE amplifier with Emitter resistance, Emitter follower, Miller's Theorem and its dual.

UNIT –V

FET amplifiers

FET Biasing, FET Common Source amplifier, Common Drain amplifier, Common Gate amplifier. Generalized FET amplifier, Biasing FET. FET as Voltage Variable Resistor, Comparison of BJT and FET, Comparison of JFET and MOSFET.

MOS amplifiers: MOS small signal model. Common source and Common Drain amplifiers at Low Frequencies.

Text books:

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 3rd Edition, TMH.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9th Edition, 2006, PHI.

Reference books:

1. Microelectronics – Jacob Millman, Arvin Grabel 2nd edition, TMH
2. Microelectronic circuits - Sedra and Smith, 5th Edition, 2009, Oxford University press.

16EC2102 – THEORY OF SIGNALS AND SYSTEMS

II Year B.Tech. I Sem

L	T	P/D	C
4	1	-/-	4

Prerequisite(s): 16MA1101 – Mathematics - I
16MA1201 –Mathematics - II

Course objectives:

Develop ability to

1. Distinguish different types of Signals, Systems and basic operations on a signal.
2. Understand the concept of orthogonality and approximation of a signal in terms of mutually orthogonal signals.
3. Understand the conversion of both periodic and aperiodic continuous/discrete time domain signal into frequency domain using Fourier series, Fourier transform and Z transform.
4. Understand concepts of convolution and correlation.
5. Understand properties and characteristics of a linear time invariant system.
6. Understand usage of Laplace and Z transforms in the analysis of continuous time and discrete time systems.
7. Understand basic concepts of Single Random Variable, multiple Random Variables and computation of statistical parameters of Random Variables.

Course Outcomes:

After end of the course, the student will be able to

CO 1. Analyze a given signal in Time domain.
CO 2. Analyze a given signal/system using Fourier, Laplace and Z transform / domains.
CO 3. Able to perform convolution / correlation on signals / systems.
CO 4. Solve linear differential/difference equations using Laplace / Z- transform.
CO 5. Distinguish different types of distribution and density functions of a single random variable and its applications.
CO 6. Distinguish different types of joint distribution and density functions and their applications.
CO 7. Calculate statistical parameters of a single random variable and multiple random variables.

UNIT – I

Signal Analysis

Introduction to signals and systems, classification of signals, basic operations on signals, classification of systems, Analogy between vectors and signals, Orthogonal signal space, signal

approximation using orthogonal functions, mean square error, closed or complete set of orthogonal functions, orthogonality in complex functions

UNIT - II

Fourier Representation of Continuous Time Signals

Fourier Series: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum, Gibb's phenomenon.

Fourier Transforms: Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum functions. Inverse Fourier transforms, Introduction to Hilbert Transform.

UNIT - III

Signal Transmission through Linear Systems

Linear Time Invariant (LTI) systems, Linear Time Variant (LTV) systems, Transfer functions of a LTI system. Impulse response of LTI system, Distortion less transmission through a system. Convolution and Correlation: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms, response of a system using convolution. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, power density spectrum. Relation between auto correlation function and energy/power spectral density function. Relation between the convolution and correlation

UNIT - IV

Laplace Transform and Z–Transform

Laplace transform: Review of Laplace transforms, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of Laplace transforms, Laplace transform of certain signals using waveform synthesis. Inverse Laplace transform, partial fraction expansion, solution of differential equations using Laplace transforms.

Z–transform: Concept of Z- transform of a discrete signal, Region of convergence in Z-transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms, solution of difference equations using Z transform.

UNIT - V

Random Variables

Basics of Probability and Random Variables.

Concepts of Joint Probability, Conditional Probability. Baye's Theorem

Random Variables and operations on Single and Multiple Random Variables: Definition, CDF and PDF of a random Variable and their Properties, classification of Random Variables, Transformation of Random variables, concept of multiple random variables, Joint Distribution and its Properties, Marginal Distribution and Conditional Distribution, Density of sum of Random Variables, Central limit Theorem (Qualitative Treatment),

Moments of single and multiple Random Variable/s- Moments about origin and Central Moments, Moment Generating Function, Characteristic Function and properties.

Commonly used distribution functions: Binomial, Poisson, Uniform, Gaussian, Exponential and Rayleigh and computation of their moments

TEXT BOOKS:

1. Signals, Systems & Communications – B.P. Lathi, BS Publications, 2003.
2. Signals and Systems – A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Probability, Random Variables and Random Signal Principles – Peyton Z. Peebles, 4th Edition, 2001, TMH.

REFERENCES:

1. Signals and Systems: Continuous and Discrete by Rodger E.Ziemer , William H Tranter , D. R. Fannin, 4th Edition Pearson Education Limited.
2. Signals and systems, Schaum's outlines – Hwei Hsu, McGraw Hill Professional, 1995
3. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, 4th Edition, TMH

16EC2103 – SWITCHING THEORY AND LOGIC DESIGN

II Year B.Tech. I Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): None

Course Objectives:

Develop ability to

1. Understand basic concepts of various number systems used in digital systems.
2. Understand Boolean algebra and various Boolean simplification theorems.
3. Understand simplification of Boolean functions using k-map and tabular method.
4. Understand design and analysis of combinational and sequential logic circuits.
5. Understand the concepts of various memories and PLDs.
6. Understand symmetric functions and design the same using relay contacts.
7. Understand Threshold logic and design switching functions using threshold elements.

Course Outcomes:

At the end of the course, student would be able to

CO 1. Perform conversions from one number system to another.

CO 2. Simplify switching functions using Boolean minimization theorems, map method and tabulation method.

CO 3. Analyze and design combinational and sequential logic circuits. Analyze and design logic circuits that are hazard free.

CO 4. Synthesize logic circuits using PLDs.

CO 5. Synthesize symmetric functions using relay contact networks.

CO 6. Design switching circuits using threshold elements.

UNIT I

Number Systems

Number Systems, Base Conversion Methods, Binary arithmetic, Complements of Numbers, Codes-Binary Codes, Binary Coded Decimal (BCD) Code and its Properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

Boolean Algebra and Switching Functions: Switching algebra, Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates. Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT II

Minimization of switching functions

Introduction, Minimization with theorems, The Karnaugh Map Method, Four, Five and six Variable maps. Prime implicants and essential prime implicants. Don't care map entries, using

the map for simplifying Boolean expressions, Tabular method, partially specified expressions, Multi-output minimizations.

UNIT III

Design of Combinational Circuits

Design using Conventional Logic gates, Data Selectors, Encoders, Priority Encoder, Decoders, comparators, Adders, multiplexers, De-multiplexers, realization of switching functions using MUX, Parity generators and code converters. Static Hazards and Hazard Free Realizations.

Memory Elements and Programmable Logic Devices

Types of Memory Elements (RAM and ROM). Basic PLDs - ROM, PROM, PLA and PAL. Realization of Switching functions using PLDs.

UNIT IV

Synthesis of Symmetric Networks

Relay Contacts, Analysis and Synthesis of Contact Networks, Symmetric Networks, Identification of Symmetric Functions and realization of the same.

Threshold Logic:

Threshold Element, Capabilities and Limitations of Threshold logic, Elementary Properties, Synthesis of threshold networks (Unate function, Linear seperability, Identification and realization of threshold functions, Map based synthesis of two-level Threshold networks).

UNIT V

Sequential Machines Fundamentals

Introduction, NAND/NOR latches, SR, JK, JK Master slave, D and T Flip-flops, Excitation functions of SR, JK, JK Master Slave, D and T Flip-flops. State table, State Diagram, State Assignment. Finite State Model - Basic Definitions. Synthesis of Synchronous Sequential circuits - Sequence Detector, Serial Binary adder, Binary counter and Parity bit generator.

Counters and Shift Registers

Ripple Counter, Shift Registers and their types, Ring Counters, Twisted Ring Counters.

Text Books:

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 2nd Edition, 2009, Cambridge University Press.
2. Digital Design- Morris Mano, PHl, 3rd Edition.

Reference Books:

1. Introduction to Switching Theory and Logic Design - Fredriac J. Hill, Gerald R. Peterson, 3d Ed, John Wiley & Sons lnc.
2. Digital Fundamentals - A Systems Approach - Thomas L. Floyd, Pearson, 2013.
3. Digital Logic Design - Ye Brian and Holds Worth, Elsevier.
4. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
5. Digital Logic Applications and Design, John M. Yarbrough, Thomson Publications, 2006.
6. Digital Logic and State Machine Design - Comer, 3d, Oxford, 2013.

16EE2103 – ELECTRICAL CIRCUITS AND ELECTRICAL TECHNOLOGY

II Year B.Tech. I Sem

L	T	P/D	C
4	1	-/-	4

Prerequisites: 16PH1101 – Engineering Physics
16MA1101 – Mathematics - I

Course Objectives:

Develop ability to:

1. Understand the basic concepts of electrical circuits.
2. Understand the application of network theorems, basics of network topologies and locus diagrams.
3. Understand steady state and transient response of Direct Current (DC) circuits.
4. Understand two port network parameters.
5. Understand DC machines and single phase transformers.

Course Outcomes:

At the end of the course, student would be able to:

CO 1: Explain basic concepts of electrical circuits and analyze the circuits using various techniques.
CO 2: Apply various network theorems, network topology and locus diagrams to real time applications.
CO 3: Analyze steady state and transient response of DC circuits.
CO 4: Compute two port network parameters for a given network.
CO 5: Explain working of DC machines and single phase transformers.

UNIT – I

Introduction to Electrical Circuits

Circuit Concept, R-L-C Parameters, Voltage and Current Sources, Independent and Dependent Sources, Source Transformation, Voltage – Current relationship for Passive Elements (for different input signals –Square, Ramp, Saw tooth and Triangular). Kirchhoff's Laws, Network Reduction Techniques – Series, Parallel, Series Parallel, Star –to-Delta or Delta-to-Star Transformations, Nodal Analysis, Mesh Analysis, Super node and Super mesh for DC Excitations.

UNIT – II

Network Theorems (With DC)

Superposition, Reciprocity, Thevinin's, Norton's, Maximum Power Transfer, Milliman's, Compensation and Tellegen's theorems for DC excitations.

Basics of Network Topology: Definitions, Graph, Tree, Basic cut set and Basic Tie set Matrices for Planar Networks, and simple problems.

Locus diagrams - series R-L, R-C, R-L-C and parallel combination with variation of various parameters - Resonance-series, parallel circuits, concept of band width and Q factor

UNIT –III

Steady State & Transient responses

Steady State Analysis of R, L and C (in Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation

Transient Response of R-L, R-C, R-L-C Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

UNIT- IV

Two Port Networks

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameters to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, illustrative problems.

UNIT –V

DC Machines

Principle of operation of DC Machines, EMF equation, Types of Generators, Magnetization and Load Characteristics of DC Generators.

DC Motors, Types of DC Motors, Characteristics of DC Motors, Losses and Efficiency, Swinburne's Test,

Transformers and Their Performance

Principle of operation of Single Phase transformer, Types, Constructional Features, Phasor Diagram on no load and on load, Equivalent Circuit, Losses and Efficiency of Transformers and Regulation, Open Circuit and Short Circuit tests (simple problems)

Text Books:

1. Engineering Circuit Analysis – W.H.Hayt and J. E. Kermmerly and S. M. Durbin 6 ed., 2008 TMH.
2. Electric circuits- A.Chakrabarthy, Dhanipat Rai & Sons.

Reference Books:

1. Basic concepts of Electrical Engineering- PS Subramanyam, BS Publications.
2. Basic Electrical Engineering- S.N.Singh, PHI.
3. Electrical Circuits- David A.Bell, Oxford University Press.
4. Electric Circuit Analysis- K.S.Suresh Kumar, Pearson Education.

16EC21L1 – ELECTRONIC DEVICES AND CIRCUITS LAB

II Year B.Tech. I Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): 16PH1201 – Applied Physics

Course Objectives:

Develop ability to

1. Be familiar with the operation of various solid state devices - p-n Diode, Zener Diode, BJT, FET, UJT and SCR and their applications.
2. Understand the frequency response of BJT and FET amplifiers.

Course outcomes:

At the end of this course, the student would be able to:

CO 1. Analyze the characteristics of p-n junction diode and Zener diode and calculate the dynamic and static resistance in forward bias and reverse bias respectively

CO 2. Calculate the ripple factor and efficiency of Half Wave and Full wave rectifiers with and without filters.

CO 3. Analyze the characteristics of BJT in Common Emitter and Common Base configurations and calculate the corresponding h-parameters.

CO 4. Analyze the characteristics of FET in Common Source configuration and calculate the g_m and r_d.

CO 5. Calculate Bandwidth of BJT/FET amplifier from its frequency response.

CO 6. Obtain the characteristics of UJT and SCR

List of Experiments

Part A

Electronic Workshop Practice (Two lab sessions):

1. Identification, specification and testing of R, L, C Components, Potentiometers, Rheostats, Switches (SPST, SPDT, DPST, DPDT and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCBs, Sensors (LDR, Thermistors, Piezo-Buzzers)
2. Identification, specification, testing of Active Devices - diode, BJT, JFET, MOSFET, Power Transistor, LED, LCD, SCR and UJT.
3. Study and operation of Multimeter, Voltmeter , Ammeter, Function Generator, Regulated Power Supply and CRO

Part B

(A minimum of 10 experiments are to be conducted)

1. Static and dynamic resistances of a p-n junction diode from its V-I Characteristics.
2. Percentage regulation of Zener diode voltage regulator for various resistive loads.
3. Ripple factor and percentage regulation of Half Wave Rectifier with & without filters (Capacitor filter).
4. Ripple factor and percentage regulation of Full Wave Rectifier with & without filters (L section and π section).
5. Input & Output characteristics of BJT in CB Configuration and h-parameter calculation.
6. Input & Output characteristics of BJT in CE Configuration and h-parameter calculation.
7. FET (Common Source) Characteristics and calculation of g_m and r_d.
8. Design of self-bias circuit for BJT.
9. Frequency response of CE amplifier.
10. Frequency response of common source FET amplifier.
11. SCR characteristics
12. UJT characteristics

Additional Experiments:

13. Characteristics of LED
14. Characteristics of MOSFET

Equipment required:

(a) Regulated Power Supplies (RPS) 0-30 V
(b) CROs 0-20 MHz.
(c) Function Generators 0-1 MHz
(d) Multimeters
(e) Decade Resistance Boxes/ Rheostats
(f) Decade Capacitance Boxes
(g) Ammeters (Digital)
0-200 μA, 0-200 mA
(h) Voltmeters
0-20 V, 0-30 V
(i) Electronic Components:
Resistors, Inductors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs (IR540), Diodes- Ge & Si type, Transistors –NPN, PNP type, LDRs, Bread boards.
(j) Demo components: Potentiometers, Rheostats, Switches – SPST, SPDT, DPST, DPDT and DIP, Coils, Gang condensers, Relays, PCBs, Thermistors, Piezo Buzzers and Power transistors 3055

16EC21L2 - SIMULATION LAB - I

II Year B.Tech. I Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): 16MA1101 – Mathematics – I
16MA1201 – Mathematics - II

Course Objectives

Develop ability to

1. Understand simulation of various signals/sequences and their synthesis.
2. Understand various operations such as addition, multiplication, amplitude/time scaling, shifting and folding of signals / sequences.
3. Understand the characteristics of an LTI system and find its response for various input signals such as unit impulse, unit step and sinusoidal signal.
4. Understand the principle of convergence of Fourier Series of a given signal and express the signal in its frequency domain.
5. Understand the cumulative distribution function, probability density function of a random variable and find its moments.

Course Outcomes:

At the end of the course, student would be able to

CO 1. Synthesize a given waveform using standard test signals and sequences.
CO 2. Analyze the effect of various transformations applied on independent and dependent variables of a signal.
CO 3. Determine the symmetry (even/odd) of signals /sequences.
CO 4. Classify a system based on its characteristics and find its response for various excitations.
CO 5. Convert time domain signal into frequency domain using Fourier transform and plot its magnitude and phase spectrum.
CO 6. Find and plot the cumulative distribution function, probability density function of a random variable and compute the moments of a random variable.

Note:

All the experiments are to be simulated using MATLAB / SCILAB / LabView / OCTAVE or equivalent software

List of Experiments:

(A minimum of 12 experiments are to be conducted)

1. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.

2. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Finding the even and odd parts of Signal/Sequence and real and imaginary parts of a complex Signal.
4. Convolution between (i) Signals (ii) sequences.
5. Auto Correlation between (i) Signals (ii) Sequences.
6. Cross Correlation of (i) Signals (ii) Sequences
7. Verification of Linearity and Time Invariance Properties of a given Continuous / Discrete System.
8. For the given LTI system
    a) Computation of Unit sample, Unit step and Sinusoidal responses
    b) Verifying its physical realizability and stability properties.
    c) Locating the poles and zeros in s-plane and z-plane.
9. Verification of Gibbs Phenomenon.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Find and plot the cumulative distribution and probability density functions of a random variable.
13. Finding the moments of a random variable.

Additional Experiment:

14. Verification of central limit theorem

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Equipment required:

a. PCs
b. Software : MATLAB / SCILAB / LabView / OCTAVE or equivalent software

16EE21L2– ELECTRICAL ENGINEERING LAB

II Year B.Tech. I Sem
Prerequisites: None

L	T	P/D	C
-	-	3/-	2

Course Objectives:

Develop ability to:

1. Understand network theorems.
2. Understand series and parallel resonance in R-L-C network.
3. Understand time response of R-C/R-L network.
4. Understand two port network parameters.
5. Understand magnetization characteristics of DC shunt generator.
6. Understand Swinburne's test and brake test on DC shunt motor.
7. Understand Open Circuit (OC), Short Circuit (SC) and load tests on a single phase transformer.

Course Outcomes:

At the end of the course, student would be able to:

CO 1: Experimentally verify Network theorems.
CO 2: Determine quality factor of R-L-C network under different load conditions.
CO 3: Analyze the time response of R-L and R-C circuit for periodic non sinusoidal input.
CO 4: Calculate two port network parameters for a given network.
CO 5: Determine critical resistance and critical speed from magnetization characteristics of DC shunt generator.
CO 6: Experimentally validate efficiency of DC machine.
CO 7: Calculate efficiency, percentage regulation and determine the equivalent circuit parameters of single phase transformer.

LIST OF EXPERIMENTS (*A minimum of ten experiments are to be conducted*)

1. Verification of Kirchoff's current Law and Kirchoff's voltage Law
2. Variation of quality factor under different load conditions in series and parallel R-L-C network.
3. Time response of first order R-C/R-L network for periodic non sinusoidal input-Time constant and steady state error determination.
4. Two port network parameters: Z, Y, Parameters.
5. Verification of property of linearity (Superposition principle) and Reciprocity theorem.
6. Verification of Maximum Power Transfer theorem involving impedance.
7. Experimental verification of Thevenin's and Norton's theorems.
8. Magnetization characteristics of DC Shunt Generator.
9. Swinburne's Test on a DC Shunt Motor.

10. Brake test on DC a Shunt Motor.
11. OC and SC Tests on a single phase Transformer.
12. Load test on a single phase Transformer.

Additional Experiment:

13. Two port network parameters: ABCD and h-Parameters

Equipment Required:

- CROs (0-20MHz)
- Regulated Power Supplies (0-30V/ 2A)
- Function Generators (0 to 1 MHz)
- Digital Voltmeters (0-30V)
- Digital Ammeters (0-200mA)
- Decade Resistance Boxes
- Decade Inductance Boxes
- Decade Capacitance Boxes
- Components (Resistors, capacitors)
- Bread Boards
- DC generator-DC Motor Set
- DC Motors
- 1-Phase Transformers (2KVA, 115/230V)
- 1-Phase Variac (0-230V / 0-270V, 10A)
- Rheostats (350 ohms/1.7A, 1000 ohms / 2A)
- Watt Meters (0-5/10A, 75/150/300V LPF & UPF)
- Voltmeters (0-300V, 0-300V/600V, 0-30V/60V)
- Ammeters (0-5/10A, 0-1/2A)
- Digital Tachometer
- Resistive load bank
- Trainer kits:
  - KCL & KVL kit
  - Series and parallel R-L-C Network Trainer kit
  - Time Response of First order RC/RL Network Trainer kit
  - Verification of Superposition theorem Trainer kit
  - Verification of Maximum power transfer theorem Trainer kit
  - Two port Network parameters – Z,Y parameters Trainer kit
  - Two port Network parameters – ABCD and h-parameters Trainer kit

16EC2201- PULSE, DIGITAL AND SWITCHING CIRCUITS

L	T	P/D	C
3	1	-/-	3

II Year B.Tech. II Sem

Prerequisite(s): 16EC2101 - Electronic Devices and Circuits
16EE2103 - Electrical Circuits and Electrical Technology
16EC2103 – Switching Theory and Logic Design

Course objectives:

Develop ability to:

1. Understand the transient and steady-state response of R-C and R-L circuits for different inputs.
2. Understand the characteristics of clippers, clampers and comparators.
3. Understand the switching characteristics of transistor and its application in the design and analysis of multivibrators
4. Understand the operation of sampling gates.
5. Understand the basic principles and operation of time base generators namely, voltage and current sweep generators.
6. Understand the realization of logic gates using discrete components and comparison of logic families.

Course outcomes:

At the end of the course, student would be able to:

CO 1. Explain and demonstrate the applications of R-L and R-C circuits as integrator, differentiator and as wave shaping circuits.
CO 2. Design Clippers, Clampers and Comparator circuits.
CO 3. Design multivibrators using transistors for various duty cycles of the output waveforms.
CO 4. Explain the principle of operation of voltage and current sweep circuits.
CO 5. Analyze and realize basic logic gates using diodes and transistors and compare various logic families.

UNIT - I

LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT - II

NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators, Clamping operation, clamping circuit taking source and diode resistances into account, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, synchronized clamping.

UNIT - III

MULTIVIBRATORS

Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger circuits using transistors. Applications of multivibrators- A cascade of Bistable multivibrator (flip flop) as a counter, Clock circuits, pulse generator.

UNIT – IV

SAMPLING GATES

Basic Operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates using diodes, Reduction of pedestal in Gate Circuits, sampling gate applications: chopper amplifier, sampling scope and FET based sampling and hold circuit.

TIME BASE GENERATORS

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

UNIT - V

REALIZATION OF LOGIC GATES USING DIODES AND TRANSISTORS

Realization of AND,OR, NOT, NAND, NOR gates using Diodes and transistors, and realization of various logic families - TTL ECL and CMOS and their comparison.

Text Books:

1. Millman's Pulse, Digital and Switching Waveforms - Jacob Millman, Herbert Taub, Mothiki S Prakash Rao, 2nd edition, McGraw-Hill.
2. Pulse, switching and digital circuits-David A.Bell, 5th edition, Oxford university press,India,2015

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.
2. Fundamentals of pulse and digital circuits-Ronald.J.Tocci,3 ed. ,2008
3. Pulse and Digital Circuits - Mothiki S.Prakash Rao,2006, McGraw-Hill
4. Wave Generation and Shaping - L. Strauss, International student edition, McGraw-Hill

16EC2202- ELECTRONIC CIRCUIT ANALYSIS

II Year B.Tech. II Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16EC2101- Electronic Devices and Circuits
16EE2103– Electrical Circuits and Electrical Technology

Course Objectives:

Develop ability to

1. Understand analysis of multistage amplifiers.
2. Understand the high frequency model of BJT and FET.
3. Understand the concept of feedback in an amplifier and analysis of various feedback amplifiers.
4. Understand the concept of positive feedback in oscillators, analyze and realize R-C, L-C and crystal oscillators.
5. Understand large signal amplifiers - Class A, Class B and their power conversion efficiency.
6. Understand the analysis of tuned amplifiers -, Single tuned, double tuned and stagger tuned amplifiers and the effect of cascading of tuned amplifiers on bandwidth.

Course Outcomes:

At the end of the course, student would be able to:

CO 1. Analyse multistage amplifiers and the effect of cascading of amplifiers on bandwidth and gain.
CO 2. Analyze BJT and FET amplifiers at high frequencies.
CO 3. Analyze different types of feedback amplifiers.
CO 4. Deduce the condition for oscillations and analyze L-C, R-C and crystal oscillators.
CO 5. Analyze different types of power amplifiers and compare them in terms of efficiency.
CO 6. Analyze single tuned, double tuned and stagger tuned amplifiers and the effect of cascading of single and double tuned amplifiers on bandwidth.

UNIT –I

MULTISTAGE AMPLIFIERS

Review of single stage Transistor Amplifier Analysis. Analysis of Cascaded RC coupled BJT amplifiers, Cascode Amplifier, Darlington Pair, Different coupling schemes used in Amplifier-RC coupled amplifier, Transformer coupled amplifier, Direct coupled Amplifier.

UNIT –II

AMPLIFIERS AT HIGH FREQUENCIES

Frequency Response: Logarithms, Decibels, general frequency considerations, frequency response of BJT amplifier, analysis at Low and High frequencies, Effect of coupling and bypass capacitors. The Hybrid- pi Common Emitter Transistor Model, CE short circuit current gain, Current Gain with Resistive Load, Single Stage CE Transistor Amplifier Response, Gain-Bandwidth Product, Emitter follower at high frequencies. Common Source and Common Drain Amplifiers at high frequencies.

UNIT- III

Feedback Amplifiers and Oscillators

Feedback Amplifiers: Concept of Feedback, Classification of Feedback Amplifiers, General characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Configurations, Illustrative Problems.

Oscillators: Classification of Oscillators. Conditions for Oscillations. RC Phase shift (BJT, FET), Colpitts, Hartley, Wien –Bridge & Crystal Oscillators, Stability of Oscillators.

UNIT- IV

Large Signal Amplifiers

Classification, Class A Large Signal Amplifiers, Transformer Coupled Class A Audio Power Amplifier, Efficiency of Class A Amplifier, Class B Amplifier, Efficiency of Class B Amplifier, Class B Push -Pull Amplifier, Complementary Symmetry Class Push -Pull Amplifier, Distortion in Power Amplifiers.

UNIT- V

Tuned Amplifiers

Introduction, Q-factor, Analysis of Single Tuned and Double Tuned Amplifiers, Effect of cascading single and Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers. Applications of tuned amplifiers.

Textbooks:

1. Integrated Electronics – Jacob Millman and Christos C Halkias,1991 Ed., 2008, TMH
2. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2nd Edition., 1998, TMH.

Reference Books:

1. Microelectronic Circuits – Sedra and Smith – 5th Ed., 2009, Oxford University Press.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9th Edition, 2006, PHI
3. Electronic Circuit Analysis – K S Srinivasan, Anuradha Publications, 1st Edition.

16EC2203- ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

II Year B.Tech. II Sem

L	T	P/D	C
4	1	-/-	4

Prerequisite(s): 16PH1101 - Engineering Physics

Course Objectives:

Develop ability to

1. Understand electrostatics and its implication on capacitance.
2. Understand the concept of magnetic field and its implication on inductance.
3. Understand the concept of electromagnetic and uniform plane wave and its propagation in various media.
4. Understand the concept of transmission lines and its equivalent circuit.
5. Analyze transmission line as impedance matching device.

COURSE OUTCOMES:

At the end of the course, student would be able to:

CO 1. Explain the concept of static electric and magnetic fields and their implications.
CO 2. Explain Maxwell's equations and their applications in static and time varying electric and magnetic fields.
CO 3. Explain the concept of Electromagnetic wave and its characteristics in different propagation media.
CO 4. Analyze basic transmission line parameters in terms of its electrical equivalent and its applications as various circuit elements at RF and UHF.

UNIT –I:

Electrostatics

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

Convection and Conduction Currents, Dielectric Constant, Linear, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Uniqueness Theorem, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT – II:

Magnetostatics

Biot- Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials,

Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric – Conductor Interfaces, Method of Images, Maxwell's Equations in Different Final Forms and Word Statements, Maxwell's Equations for Semi-Conductors, Illustrative Problems.

UNIT- III

EM Wave Characteristics:

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

UNIT – IV

Transmission Lines I

Concept of symmetrical network T and π networks, Types of transmission lines and Parameters, Transmission Line Equations, Infinite Line characteristic impedance, Distortion less transmission Line, Loading – concept and Types of Loading of transmission line, Campbell's formula, Illustrative Problems.

UNIT – V

Transmission Lines II

Input Impedance at any point on the transmission line, RF and UHF Lines, SC and OC Lines, $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Reflection Coefficient, VSWR, Smith Chart and its applications, Single and Double Stub Matching, Illustrative Problems.

Text books:

1. Elements of Electromagnetics – Mathew N.O.Sadiku, 4 ed., 2008, Oxford Univ.Press.
2. Electromagnetic Waves and Radiating Systems – E.C.Jordan and K.G.Balmain, 2nd ed., Pearson.
3. Networks, Lines and Fields – John D.Ryder, 2nd ed., PHI.

Reference Books:

1. Engineering Electromagnetics - Nathan Ida, 2nd ed., 2005, Springer (India) Pvt.Ltd., New Delhi.
2. Electromagnetics with Applications – John Daniel Kraus, Daniel A. Fleisch, 5th edition, McGraw-Hill.
3. Engineering Electromagnetics – William H. Hayt and John A.Buck, 7th ed., 2006, TMH.
4. Transmission Lines and Networks - Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi

16EC2204- ANALOG COMMUNICATIONS

II Year B.Tech. II Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16EC2102 - Theory of Signals and Systems

Course Objectives:

Develop ability to:

1. Understand various analog modulation techniques and their demodulation techniques.
2. Understand the concept of random processes and its classification.
3. Understand the importance of noise in communication systems and its effect on system performance.
4. Understand the principles of pulse modulation and demodulation techniques.

Course Outcomes:

At the end of the course, student would be able to

CO 1. Explain various analog modulation and demodulation techniques.

CO 2. Explain the concept of random processes and analyze the parameters in time and spectral domains.

CO 3. Evaluate the performance of communication system under noise conditions.

CO 4. Explain the principles of pulse modulation and demodulation techniques.

UNIT I

AMPLITUDE MODULATION

Introduction to communication system, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation – DSBSC, SSBSC, DSBFC -Definition, Time domain and frequency domain description, single tone modulation, power relations, Generation and demodulation using various methods - Balanced Modulators, Ring Modulator, Square Law Modulator, Switching modulator, Phase discrimination method, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, Square law detector, Envelope detector, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT II

ANGLE MODULATION

Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

UNIT III

STOCHASTIC PROCESSES

Concept Of Stochastic Process and classification - Deterministic and Nondeterministic Processes, concept of Stationarity, N-Order stationarity of a process, Strict-Sense and wide – sense Stationary processes, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Auto and cross correlation of random processes, Gaussian Random Processes, Poisson Random Process. Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, the Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System.

UNIT IV

NOISE IN ANALOG COMMUNICATION SYSTEMS

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

UNIT V

RECEIVERS

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

PULSE MODULATION

Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing.

Textbooks:

1. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
2. Modern Digital and Analog Communication Systems B.P. Lathi, Zhi Ding, Oxford University Press, 2009

References Books:

1. Electronic Communications –Dennis Roddy and John Coolean, $th Edition,PEA,2004.
2. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.
3. Principles of Communication Systems – H Taub, D. Schilling, Gautam Saha, TMH, 2007 3rd Edition
4. Analog communication systems – Dr. Sanjay Sharma, SK Kataria & Sons, 2014.

16CH2201 - ENVIRONMENTAL STUDIES

II Year B.Tech. II Sem

L	T	P/D	C
3	-	-/-	3

Pre requisite: None

Course Objectives

Develop ability to

1. Identify the importance of ecosystem and its functions.
2. Understand the natural resources and their usage in day to day life.
3. Understand the concept of bio-diversity, its values and conservation.
4. Be aware of the causes of different types of pollution and its control.
5. Understand various environmental impacts, requirement of various policies and legislations towards environmental sustainability.

Course Outcomes

After the completion of the course, the student would be able to

CO 1. Explain ecosystem and its functions namely, food chain, ecological pyramids etc.

CO 2. Acquire knowledge about different types of natural resources such as land, water, Minerals, non-renewable energy and their excessive usage leading to detrimental effects on environment.

CO 3. Comprehend ecosystem diversity, its values and importance of hot spots to preserve the same.

CO 4. Explain different types of pollution, its control and impact on global environment.

CO 5. Recognize various environmental impacts and the importance of various acts and Policies towards environmental sustainability.

UNIT- I

Ecosystem

Scope and importance of ecosystem, Classification of ecosystem, Introduction to biotic and abiotic components, Forest and desert ecosystem, Functions of eco system food chains, food webs and ecological pyramids, Flow of energy in an ecosystem, Biogeochemical cycles, Nitrogen cycle and Carbon cycle, Phosphorous cycle and Hydrological cycle.

UNIT- II

Natural Resources

Classification of resources, Water resources-Use and over utilization of surface and ground water, Mineral resources-Environmental effects of extracting and using mineral resources –Case

study, Land resources – Land degradation, man induced landslides, Energy resources – renewable, solar energy, wind energy, applications, Non renewable resources- fossil fuels, nuclear energy, Chernobyl and Fukushima Daiichi nuclear disasters.

UNIT- III

Biodiversity and Biotic Resources

Introduction, definition, genetic, species and ecosystem diversity, Types of diversity, Alpha, Beta and Gamma, Value of biodiversity- Consumptive use, productive use , ethical, aesthetic and intrinsic values , Hotspots of biodiversity in India, Threats to biodiversity, Conservation of biodiversity – In-situ and Ex-situ methods, bioaccumulation and biomagnifications.

UNIT- IV

Environmental Pollution and Control Technologies

Classification of Pollution, Air pollution causes, effects and remedial measures , Water pollution, causes, effects and remedial measures, Noise Pollution, Emission standard limits, Acid rains. Waste water treatment technologies- Common and Combined Effluent Treatment Plants (CETP), Thermal Pollution causes, effects and remedial measures, Solid Waste Management , Green house effect and Global warming, Ozone layer depletion and its effects .

UNIT- V

Environmental Policy, Legislation & EIA

Definition of Impact and Types of Impact, Steps involved in Environmental Impact Assessment (EIA) methodology, methods of base-line data acquisition, Impacts of development on different environmental components, Prediction of Impacts , Methods of rain-water harvesting traditional and modern methods , National Environmental Policy. Air conservation act , Water conservation act, Forest conservation act.

Towards Sustainable Future: Concept of Sustainable development, Threats of sustainable development, Environmental Education, Conservation of resources, Concept of Green building.

Text books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha - University Grants Commission.
2. Environmental Studies by Anubha Kaushik & C.P. Kaushik

Reference books:

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, B S Publication
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Introduction to Environmental Management by Mary.k. Theodare, Louis Theodare, CRC Press, Taylor &Francis group.
4. Fundamentals of Ecology by Eugene P.Odum, Gary W.Barrett, Thomson International.

16EC22L1- ELECTRONIC CIRCUITS AND PULSE CIRCUITS LAB

II Year B.Tech. II Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): 16EC2101 - Electronic Devices and Circuits
16EE21L2 - Electrical Circuits and Electrical Technology

Course objectives:
Develop ability to:

1. Obtain the frequency response of amplifiers with and with out feedback.
2. Understand the design considerations of an oscillator namely, RC phase shift oscillator, Wein bridge oscillator and UJT relaxation oscillator for a given frequency of oscillations.
3. Understand the design considerations of large signal amplifiers namely, Class A and Class B
4. Understand the features of Darlington pair.
5. Understand the differences between linear and non linear wave shaping.
6. Understand the switching characteristics of a transistor and its application in the design and analysis of multivibrators.
7. Understand the principle of Schmitt trigger.

COURSE OUTCOMES:
At the end of the course, student would be able to:

CO 1. Analyze Common-Emitter amplifier circuit.
CO 2. Design and analyze Wein bridge and RC phase shift oscillators.
CO 3. Design and analyze linear and non-linear wave shaping circuits.
CO 4. Design and analyze multi-vibrators using transistors.

Part A
ELECTRONIC CIRCUITS
(A Minimum of Six Experiments are to be conducted)
List of Experiments:

1. Frequency response of two-stage RC coupled BJT/FET amplifier
2. Feedback Amplifiers (Voltage Series)
3. Feedback Amplifiers (Current Series)
4. Wien Bridge Oscillator using Transistors
5. RC Phase Shift Oscillator using Transistors
6. Series fed Class A Power Amplifier
7. Class B Complementary- Symmetry Power Amplifier
8. Darlington amplifier

Part B

PULSE CIRCUITS

(A Minimum of Six Experiments are to be conducted **using hardware)**

List of Experiments:

1. Linear Wave Shaping.
    a. RC Low Pass Circuit for different time constants.
    b. RC High Pass Circuit for different time constants.
2. Non - Linear Wave Shaping.
    a. Transfer Characteristics and response of Clippers:
        i. Positive and Negative Clippers
        ii. Clipping at two independent levels
    b. The Steady state output waveform of clampers for a square wave input
        i. Positive and Negative Clampers
        ii. Clamping at reference voltage
3. Switching characteristics of a transistor
4. Design Bistable Multivibrator and plot its base and collector waveforms
5. Design Astable Multivibrator and plot its base and collector waveforms
6. Design Monostable Multivibrator plot its base and collector waveforms
7. Schmitt Trigger
8. UJT relaxation Oscillator

Additional Experiments:

1. Current Series Feedback amplifier
2. Bootstrap sweep circuit
3. Miller sweep circuit

Equipment required:

1. Regulated Power Supply (0-30V)
2. CROs (0-20 MHz / 40 MHz / 60 MHz)
3. Functions Generators (0 – 1MHz)
4. Multi meters
5. Components (Resistors, Capacitors, Diodes, BJTs, UJTs)
6. Trainer kits for the follows:
    a. Class-A power amplifier
    b. Schmitt Trigger
    c. Astable multivibrator
    d. Study of Miller sweep circuit
    e. Class-B power amplifier (Complementary symmetry)
    f. Phase shift oscillator
    g. Bootstrap voltage sweep generator
    h. Darlington emitter follower

i. Wein bridge oscillator
j. UJT relaxation oscillator
k. Bistable multivibrator
l. Monostable multivibrator
m. Clipping and clamping circuits
n. Feedback amplifier
o. Low pass filter using op-amp (second order)
p. High pass filter using op-amp (second order)
q. Transistor as a switch
r. RC coupled amplifier.

16EC22L2 - ANALOG COMMUNICATIONS LAB

II Year B.Tech. II Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): 16EC2102 - Theory of Signals and Systems

Course objectives:

Develop ability to:
1. Understand various analog modulation techniques namely, amplitude modulation, frequency modulation, phase modulation and pulse modulation; their demodulation techniques and spectra.
2. Understand the concept of multiplexing and demultiplexing.
3. Understand the principle of sampling theorem.
4. Understand the principle of Automatic Gain Control.

Course Outcomes

At the end of the course, student would be able to
CO 1. Analyze Amplitude modulation and demodulation techniques using trainer kit.
CO 2. Demonstrate generation and demodulation of Frequency Modulation (FM) signal and principles of pre-emphasis, de-emphasis circuits used in Frequency Modulation
CO 3. Demonstrate the conversion of analog signal into discrete signal using Sampling
CO 4. Demonstrate Time Division Multiplexing and De-multiplexing using trainer kit.
CO 5. Demonstrate various pulse modulation techniques using trainer kit.

List of experiments (Experiments are conducted in cyclic fashion):
(A minimum of 10 experiments are to be conducted using trainer kits in cyclic form)
1. Amplitude Modulation and Demodulation
2. DSB-SC Modulation & Detector
3. SSB-SC Modulator & Detector
4. Frequency Modulation and Demodulation
5. Study of Spectrum Analyzer and Analysis of AM and FM Signals
6. Pre-emphasis & De-emphasis
7. Time Division Multiplexing and De multiplexing
8. Frequency Division Multiplexing and De multiplexing
9. Verification of Sampling Theorem
10. Pulse Amplitude Modulation & De modulation
11. Pulse Width Modulation & De modulation
12. Pulse Position Modulation & De modulation
13. AGC Characteristics

Additional Experiments:

14. Frequency Synthesizer
15. PLL as FM De-modulator

Equipment required:

1. RPS (Regulated Power Supply) : 0-30V
2. CROs : 20MHz /40 MHz /60 MHz
3. DSOs : 50 MHz
4. Function Generator : 0-1 MHz
5. Spectrum Analyzer – 9 KHz to 3 GHz
6. Lab Trainer Kits (Minimum one of each type) for
    a. Amplitude modulation and demodulation
    b. Synchronous detector
    c. Single side band system
    d. Frequency modulation and demodulation trainer
    e. Pre-emphasis and de-emphasis trainer
    f. Analog / digital Time division multiplexing and demultiplexing
    g. Frequency division multiplexing and demultiplexing
    h. Verification of Sampling theorem
    i. Pulse Amplitude modulation and demodulation
    j. Pulse width modulation and demodulation
    k. Pulse position modulation and demodulation
    l. AGC characteristics trainer
    m. Frequency Synthesizer
    n. Phased Locked loop using LM565

16EC22L3- SIMULATION LAB - II

II Year B.Tech. II Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): 16EC2101- Electronic Devices and Circuits
16EC2102 – Theory of Signals and Systems
16EC21L2 - Simulation Lab - I

Course objectives:

Develop ability to:

1. Understand the concept of stationarity of a random process.
2. Understand various analog modulation and demodulation schemes.
3. Understand the frequency response of various single stage and multi stage amplifiers.
4. Understand the performance of various large signal amplifiers and oscillators.

Course Outcomes:

At the end of the course, student would be able to

CO 1. Identify and remove noise from a signal/sequence using autocorrelation function.
CO 2. Verify the relation between auto correlation and power spectral density of a signal.
CO 3. Simulate single stage and two stage amplifiers.
CO 4. Simulate large signal amplifiers and oscillators.

Part A

The experiments are to be simulated using MATLAB / SCILAB / LabView / OCTAVE or equivalent software

(A Minimum of six experiments are to be conducted)

List of Experiments:

1. Checking the given random process for stationarity.
2. Estimation of signal in the presence of noise
3. Verification of Weiner – Khinchine relation
4. Verification of Sampling theorem
5. Amplitude modulation (AM-DSBSC, AM-DSBFC) and demodulation-study of magnitude spectrum
6. Frequency modulation and demodulation-study of magnitude spectrum
7. Time division multiplexing and de-multiplexing
8. Pulse Width Modulation

Part B

The experiments are to be simulated using Multisim/ LTspice or equivalent software
(A Minimum of six experiments are to be conducted)
List of Experiments:

1. Common Source Amplifier
2. Common Base (BJT)/ Common Gate (JFET) Amplifier
3. Two Stage RC Coupled CE Amplifier
4. Cascode Amplifier (CE-CB Amplifier)
5. Darlington pair
6. Class A power amplifier with transformer load
7. Class B Complementary- Symmetry Power Amplifier
8. Hartley and Colpitt's Oscillators

Additional Experiments:

1. AM-SSBSC modulation and demodulation - study of magnitude spectrum
2. Common gate JFET amplifier

Equipment / Software required:

1. PCs
2. MATLAB / SCILAB / LabView / OCTAVE or equivalent software
3. Multisim/ LTspice or equivalent software

16HS22L1 – GENDER SENSITIZATION

II Year B.Tech. II Sem

Prerequisite(s): Nil

L	T	P/D	C
-	-	3/-	2

Course objectives:

Facilitate students to

1. Sensitize with regard to gender issues.
2. Provide a critical perspective on the requirements of healthy socialization of both genders.
3. Create awareness and understanding on some of the key biological changes of both genders.
4. Apprise on the importance of sharing domestic work and the economic contribution of women.
5. Create awareness on the impact of gender violence on society.
6. Create consciousness on the contribution of women of Telangana in its development.

Course Outcomes

At the end of the course, student would be able to

CO 1. Demonstrate sensitivity with regard to gender issues.
CO 2. Show healthy socialization among both the genders that can be observable.
CO 3. Show empathy on some of the key biological changes of both genders.
CO 4. Realize the importance of sharing domestic work and economic contribution of women.
CO 5. Realize the impact of gender violence on society.
CO 6. Show awareness on the contribution of women of Telangana in its development.

UNIT-I

UNDERSTANDING GENDER

Gender: why should we study it? *(Towards a world of equals: Unit-1)*
Socialization: Making women, making men (*Towards a world of equals*: Unit-2)
Introduction. Preparing for Womanhood. Growing up male. first lessons in caste. Different masculinities.
Just relationships: being together as Equals (***Towards a world of equals: Unit-12)***
Mary kom and Onler. Love and Acid just do not mix. Love Letters. Mother and Fathers. Further reading: Rosa Parks-The Brave Heart.

UNIT-II:

GENDER AND BIOLOGY

Missing women**:** Sex selection and its consequences *(Towards a world of equals: Unit-4)*
Declining sex Ratio. Demographic consequences.
Gender spectrum: beyond the Binary (*Towards a world of equals: Unit-10)*
Two are many? Struggles with discrimination .
Additional reading: our Bodies, our Health (*Towards a world of equals: Unit-13)*

UNIT –III:

GENDER AND LABOUR:
House work: the invisible Labour **(*Towards a world of equals: Unit-3)***

"My mother doesn't work". "share the load".
Women's work: its politics and economics (*Towards a world of equals: Unit-7)*
Factand fiction. Unrecognized and work. Further reading: Wages and condition of work.

UNIT-IV:
ISSUES OF VIOLENCE:
Sexual Harassment: Say No! *(Towards a world of equals: Unit-6)*
Sexual Harassment, not Eve-teasing- coping with Everyday Harassment-Further reading: "chupulu".
Domestic violence: speaking out (*Towards a world of equals: Unit-8)*
Is home a safe place? – When women unite [film].Rebuilding lives. Further Reading: New Forums for justice.
Thinking about sexual violence (*Towards a world of equals: Unit-11)*
Blaming the victim– "I Fought for my life ....." –Further Reading: The Caste Face of violence.

UNIT – V:
GENDER STUDIES:
Knowledge: Through the lens of Gender (*Towards a world of equals: Unit-5)*
Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged women Artists of Telangana.
Whose History? Questions for Historians and Others *(Towards a world of equals: Unit-9)*
Reclaiming a past. Writing other Histories. Further Reading: Missing pages from Modern Telangana History.

Text Book(s):
"Towards a World of Equals: A Bilingual Textbook on Gender" Written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rsheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Note**:** Since it is inter disciplinary Course, Resource persons can be drawn from the fields of English Literature or sociology or political science or any other qualified faculty who has expertise in this field.

References books:

1. Sen, Amarthya. "More than one million Women are missing." New York Review of Books 37.20 (20 December 1990). Print. "We were Making History....." Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "Bythe Numbers: Where Indian Women Work." Women's Studies Journal (14 November 2012) Available online at: http// blogs.wsj.com/ India real time/2012/11/14/by-the-number-where Indian-women-work/>
3. K. Sathyanarayana and Susie Tharu (Ed). "Steel Nibs Are sprouting: New Dalit writing South India", Dossier 2: Telugu and Kannada http://harpercollins.co.in/BookDatails.asp?Book cod=3732

4. Vimala. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the present. Volume //: the 20th Century Ed. Susie Tharu and K. Llita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatugna, Veena et al. Women's work and its Impact on Child Health and Nutrition Hyderabad, National Institute of Nutrition, Indian Council of Medical Research 1993.
6. Stree Shakti Sangatana. "We were Making History....." Life Stories of Women in the Telangana People's struggle. New Delhi: Kali for Women, 1989.
7. Menon, Nivedita. "Seeing like a Feminist". New Delhi: Zubban-Penguin Books, 2012
8. Jayaprabha A "Chupulu (Stares)". Women Writing in India: 600BC to the present. Volume //. The 20th Century Ed. Susie Tharu and K. Llita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shyan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical analysis." International Journal of Humanities and Social Science invention 2.4(2013).
10. Gautham, Liela and Gita Ramaswamy. "A conversation between a Daughter and Mother."Broadsheet on contemporary politics. Special issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed. Madhumeeta sinha and Asma Rasheed. Hyderabad: Anveshi Research center for Women's Studies, 2014
11. Abdulali Sohaila. "I Fought for for My Life ....and Won." Available online at: http//www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jaganathan Pradeep, Partha Chetterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent black and Ravi Dayal Publishers, New Delhi, 2000
13. K. Kapadia, "The violence of Develop: the politics of Identity, Gender and Social Inequalities in India". London: Zed Boos, 2002
14. S. Benhabib. "Situating the Self: Gender, Community, and post modernism in contemporary Ethics", London: Routledge, 1992
15. Viginia Woolf. "A Room of one's Own".Oxford: Black Swan. 1992
16. T. Banuri and M. Mahmood. "Just Development: Beyond Adjustment with a Human Face", Karachi: Oxford University press,1997.

16EC3101 - LINEAR AND DIGITAL IC APPLICATIONS

III Year B.Tech. I-Sem

L	T	P/D	C
4	1	-/-	4

Prerequisite(s): **16EC2101 - Electronic Devices and Circuits**
16EC2103 – Switching Theory and Logic Design
16EC2201 - Pulse, Digital and Switching Circuits
16EC2202 - Electronic Circuit Analysis

Course Objectives:

Develop ability to:

1. Understand the basic features of Operational Amplifier and its applications.
2. Understand the design of Op-Amp based Active Filters, Waveform generators, functionality of 555 Timer and 565 ICs and their applications.
3. Understand the design of various types of ADCs and DACs.
4. Understand the characteristics of different families of digital ICs and design combinational circuits using them.
5. Understand design of Sequential Circuits and memories using digital ICs.

Course Outcomes:

On completion of this course, students shall be able to

1. Explain the concepts of Operational Amplifier and its features and apply the concepts of Op-Amps in the design of Summing Amplifier, Subtractors, Comparators, differentiators, Integrators and Voltage Regulators.
2. Analyze and design Op-Amp based circuits namely Active Filters, Waveform generators; Design and apply Astable and Mono-stable multi vibrator modes using 555 Timer IC; Conceptualize Phase Locked Loop using 565 IC and explain its applications.
3. Analyze and design DACs and ADCs using various methods of implementation.
4. Compare different families of digital integrated circuits namely TTL and CMOS and their characteristics; Design various combinational circuits using digital ICs.
5. Design Sequential Circuits and memories using digital ICs.

UNIT -I

Operational Amplifier:

Introduction to Emitter Coupled Differential Amplifier using BJTs, Operational Amplifier Block Diagram, Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Design of Voltage Regulator using IC723.

UNIT -II

Applications of OPAMP IC741, IC-555 & IC 565:

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis and Design of 1^{st} order and 2^{nd} order LPF & HPF Butterworth Filters, Waveform

Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT -III

Analog to Digital and Digital to Analog Converters:

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT -IV

Digital Integrated Circuits (Only functional diagrams of the ICs to be considered, no pin diagrams): Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converter (74HC42), Design of control logic using Decoders (74HC138, 74HC153), LED & LCD Decoders with Drivers (74LS47), Encoders (74HC147, 74HC148), Priority Encoders, Multiplexers (74LS151, 74HC157), Demultiplexer (74HC154), Priority Generators/Checkers (74LS280), Parallel Binary Adder/ Subtractor (74LS283), Magnitude Comparators (74LS85). IC interfacing - TTL Driving CMOS & CMOS Driving TTL.

UNIT -V:

Sequential Logic ICs (Only functional diagrams of the ICs to be considered, no pin diagrams) Familiarity with commonly available 74XX & CMOS 40XX Series ICs – Flip-flops (74LS279A, 74LS75, 74HC112), Synchronous Counters (74LS93,74HC163), Decade Counter (74HC190), Shift Registers-(74HC164,74HC165,74HC194).

TEXT BOOKS:

1. Op-Amps & Linear Integrated Circuits – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.

REFERENCE BOOKS:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Linear Integrated Circuits and Applications – Salivahana, TMH.
3. Designing with TTL Integrated Circuits – Morris, R. L. and Miller J. R. McGraw Hill, 1971
4. Digital Design Principles and Practices – John. F. Wakerly 3/e, 2005.

16EC3102 – MICROPROCESSORS AND MICROCONTROLLERS

III Year B.Tech I Sem

L	T	P/D	C
3	1	- / -	3

Prerequisite(s): **16EC2103** – Switching Theory and Logic Design

Course Objectives:

Develop ability to:

1. Understand the concepts of 8086 microprocessor architecture, addressing modes and programming.
2. Understand interfacing of 8086, with memory and other peripherals.
3. Understand the architecture and features of 8051 Microcontroller, and programming.
4. Understand interrupts, timers/ counters and serial communication modes of 8051.

Course Outcomes:

At the end of the course, student would be able to:

CO 1: Explain the architecture and modes of operations of 8086 Microprocessor.
CO 2: Write assembly language programs (ALPs) for 8086 Microprocessor.
CO 3: Design 8251, 8255 interfaces for 8086 Microprocessor.
CO 4: Explain the Architecture and features of 8051;
CO 5: Design and develop ALP code for 8051 Microcontrollers.
CO 6: Explain the operation of the interrupts, timers/ counters and serial communication interface for 8051 Microcontrollers.

UNIT I:

8086 Microprocessor: Introduction, 8086 Architecture, Register organization, Memory segmentation, Physical memory organization, Pin diagram and Signal description of 8086 - Minimum mode signals, Maximum mode signals, Common function signals, Timing diagrams – Read and Write for minimum and maximum modes.

UNIT II:

Instruction set and assembly language programming of 8086: Instruction formats, Addressing modes, Instruction set, Assembler directives, Macros, Simple programs involving - logical, branch and call instructions, sorting, evaluating arithmetic expressions and string manipulations.

UNIT III:

I/O Interface (8255-PPI): Pin diagram and internal architecture, Modes of operation and interfacing to 8086, Interfacing - keyboard, 7-segment display, D/A and A/D converters.

Interrupts: Interrupt structure of 8086, vector interrupt table, Interrupt Service Routines (ISR).

Communication Interface: Serial communication standards, serial data transfer schemes, 8251 USART architecture and interfacing.

UNIT IV:

Microcontrollers: Introduction, 8051 microcontrollers, Pin Diagram and Architecture, memory organization, Memory interfacing, I/O ports, Addressing modes, Instruction set of 8051, Simple programs – arithmetic and logic operations, sorting, branch and call instructions.

UNIT V:

Interrupts: Interrupt structure of 8051, vector interrupt table, interrupt service routine, Programming external hardware interrupts

Timers/Counters: Various modes of timers/counters, Programming 8051 timers/counters, Programming timer interrupts.

Serial communication: serial communication standards, serial data transfer schemes, UART operation, Programming the serial communication interrupts.

Text Books:

1. Douglas V. Hall, Microprocessor and interfacing, TMGH, 2nd edition 2006
2. Kenneth J. Ayala, The 8051 Microcontroller. 3rd Ed., Cengage Learning.

Reference Books:

1. Advanced Microprocessors and peripherals, A.K Ray and K.M Burch and TMH, 2nd Edition 2006.
2. Micro controllers and Applications - Ajay. V. Deshmukh, TMGH,2005
3. Microcomputer systems, the 8086/8088 Family, architecture, Programming & Design, Yu-Chang Liu & Glenn A Gibson, PHI, 2nd Edition.

16EC3103-ANTENNAS AND WAVE PROPAGATION

III Year B.Tech. I Sem.

L	T	P/D	C
4	-	- / -	4

Prerequisite(s): 16EC2203 - Electromagnetic Theory and Transmission Lines

Course Objectives:

Develop ability to:

1. Understand radiation mechanisms of various Antennas.
2. Analyze various characteristics and parameters of Antennas
3. Design antenna arrays
4. Understand various aspects involved in Antenna Measurements
5. Understand the concepts of wave propagation and its characteristics in atmospheric conditions.

Course Outcomes:

At the end of the course, student would be able to:

CO 1. Explain radiation mechanism and define various parameters of an antenna.

CO 2. Explain radiation mechanism in Loop, Helical and Horn antennas and design Yagi–Uda antenna

CO 3. Explain the working principles of Microstrip, Reflector and Lens antennas

CO 4. Design different types of arrays and explain the test procedures involved in Antenna Measurements

CO 5. Explain the mechanisms of wave propagation and atmospheric effects on radio wave propagation.

UNIT – I

Antenna Basics & Dipole antennas

Introduction, Basic antenna parameters- Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective height, Fields from oscillating dipole, Field Zones, Polarization – Linear, Elliptical, & Circular polarizations, Antenna temperature, Antenna impedance, Front–to-back ratio, Antenna theorems, Radiation – Basic Maxwell's equations, Retarded (Time varying) potential-Helmholtz Theorem, The Alternating Current Element, Power radiated by a current element, Radiation form Quarter wave Monopole or Half wave Dipole, Illustrative problems.

UNIT – II

VHF, UHF and Microwave Antennas – I

Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistance of loops (Qualitative Treatment), Arrays with Parasitic Elements - Folded Dipoles, Yagi - Uda Antenna. Helical Antennas- Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial mode, Normal Mode. Horn Antennas- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns (Qualitative treatment only), Illustrative Problems.

UNIT – III

VHF, UHF and Microwave Antennas – II

Microstrip Antennas- Introduction, salient features, advantages and limitations, Rectangular microstrip antennas- Geometry, parameters and characteristics (Qualitative treatment only) Reflector antennas - Introduction, Flat sheet and corner reflectors, Paraboloidal reflectors- geometry, pattern, characteristics, Feed Methods

Lens Antennas - Geometry of Non-metallic Dielectric Lens antennas, Zoning, Applications, Illustrative Problems.

UNIT- IV

Antenna Arrays and Measurements

Point sources - Definition, Patterns, arrays of 2 Isotropic sources - Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, Derivation of their characteristics and comparison, BSA with Non-uniform Amplitude Distributions - General considerations and Binomial Arrays, Illustrative problems.

Antenna Measurements- Introduction, Concepts- Reciprocity in antenna measurements, Near and Far Fields, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement , Gain Measurements (by comparison, Absolute and 3-Antenna Methods)

UNIT – V

Wave Propagation

Introduction, Friis transmission formula, Modes of wave propagation - Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflection, wave tilt, Space wave propagation - Introduction, field strength of space or tropospheric wave, effect of earth's curvature, Super refraction, fading. Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Illustrative problems.

Text Books:

1. John D. Kraus, Ronald. J. Marhefka and Ahmad S Khan "Antennas and Wave Propagation", Tata McGraw-Hill Education Private Limited, 4th Edition
2. E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2007.
3. K.D. Prasad, SatyaPrakashan, "Antennas and Wave Propagation," Tech. India Publications

Reference Books:

1. Constantine A.Balanis, "Antenna Theory: Analysis and Design", John Wiley & Sons
2. Hubert J. Visser "Antenna Theory and Applications", John Wiley & Sons.

16MB3101- MANAGEMENT SCIENCE

III Year. B.Tech. I Sem
Prerequisite(s): None

L	T	P/D	C
3	-	-	3

Course Objectives: Develop ability to

1. Recognize the functions and functional areas in management.
2. Understand production operations and grab the concepts of marketing management. Understand the relation between production, operations and marketing management.
3. Integrate HRM function for better function of the organization.
4. Discuss the key elements in strategic management.
5. Enhance value through world class quality of product or service .

Course Outcomes (COs):

At the end of the course, student would be able to:

CO1: Infer the importance of management its functions and its role in motivating and leading the organization.
CO2: Summarize production functions and marketing functions. Specify their inter relationship.
CO3: Plan and control the HR function better.
CO4: Formulate different strategies for different businesses or service organizations.
CO5: Ensure value in offer through quality in delivery.

UNIT - I:

Introduction to Management and Organization: Concepts of Management and organization- nature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory- Fayol's Principles of Management- Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management, Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types and Evaluation of mechanistic and organic structures of organization and suitability.

UNIT - II:

Operations and Marketing Management: Principles of operations management, types of Plant Layout-methods of production (job, batch and mass production), Work Study - Basic procedure involved in method study and work measurement. Statistical Quality Control: control charts for Variables and Attributes (simple Problems) and Acceptance Sampling.

Marketing management: Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

UNIT - III:

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

UNIT - IV:

Strategic Management: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

UNIT - V:

Contemporary Strategic Issues: Bench Marking and Balanced Score Card , TQM, Six Sigma, Deming's contribution to quality, Objectives of Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Store Records - JIT System, Supply Chain Management. Business Process Reengineering (BPR)

Text Books

1. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.
2. P. Vijay Kumar, N. Appa Rao and Ashnab, Chnalill, Cengage Learning India, 2012.

Reference Books

1. Kotler Philip and Keller Kevin Lane: Marketing Management, Pearson, 2012.
2. Koontz and Weihrich: Essentials of Management, McGraw Hill, 2012.
3. Thomas N. Duening and John M. Ivancevich Management - Principles and Guidelines, Biztantra, 2012.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2012.
5. Samuel C. Certo: Modern Management, 2012.
6. Schermerhorn, Capling, Poole and Wiesner: Management, Wiley, 2012.
7. Parnell: Strategic Management, Cengage, 2012.
8. Lawrence R Jauch, R. Gupta and William F. Glueck: Business Policy and Strategic Management Science, McGraw Hill, 2012.

16MB3121 - INTELLECTUAL PROPERTY RIGHTS
(Open Elective - I)

III Year B. Tech. I Semester

L	T	P/D	C
3	-	-	3

Pre-requisites: None

Course objectives: Develop ability to

1. Understand the various concepts, importance and types of intellectual property rights.
2. Discuss the purpose of trademarks.
3. Analyze the fundamental laws of copy rights and patents.
4. Understand trade secret laws, trade secret litigation and unfair completion.
5. Understand the latest developments in IPR.

Course outcomes (COs):

At the end of the course, student would be able to:

CO1: Acquire knowledge on intellectual property rights

CO2: Track the regulation process of trademark. Discuss the functions of trademark.

CO3: Identify the importance of copyrights, patents searching process and transfer of Ownership

CO4: Know about secret laws, unfair competition, false advertising.

CO5: Reciprocate to new developments of intellectual property rights.

UNIT - I:
Introduction to Intellectual property: Concepts, types of intellectual property, international organizations, agencies and treaties, and importance of intellectual property rights.

UNIT - II:
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT - III:
Law of Copy Rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right laws.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT - IV:

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition-misappropriation, right of publicity, false advertising.

UNIT - V:

Latest development of intellectual property Rights: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

Text Books

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw Hill Publishing Company Ltd.
3. Cornish, William Rodolph & Llewelyn, David. Intellectual property: patents, copyright, trademarks and allied rights. Sweet & Maxwell, 8/e, 2013.

References

1. Cornish, William Rodolph. Cases and materials on intellectual property. Sweet & Maxwell, 5/e, 2006.
2. Lo, Jack and Pressman, David. How to make patent drawings: a patent it yourself companion. Nolo, 5/e 2007.

16EE3122 – INDUSTRIAL SAFETY AND HAZARDS
(Open Elective – I)

III Year B.Tech I Sem

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course objectives:

Develop ability to

1. Determine responsibility for safety in the workplace.
2. Learn to recognize workplace hazards.
3. Learn how to develop procedures to eliminate of lessen those hazards.
4. Apply basic Federal and State Safety Rules to the workplace.

Course Outcomes (COs):

CO1. Understand the fundamental concepts of accident prevention with a basic knowledge of safe work rules designed to promote an accident free workplace.
CO2. Understand the relief systems.
CO3. Understand the electrical hazards and safety handling of equipments.
CO4. Understand the effects of momentum and buoyancy.
CO5. Understand different case studies.

UNIT I

FIRE AND EXPLOSION

Introduction-Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Industrial hygiene.Factories Act, 1948 and Environment (Protection) Act, 1986 and rules thereof. Shock wave propagation, vapour cloud and boiling liquid expanding vapours explosion (VCE and BLEVE), mechanical and chemical explosion, multiphase reactions, transport effects and global rates.

UNIT II

RELIEF SYSTEMS

Preventive and protective management from fires and explosion-inerting, static electricity passivation, ventilation, and sprinkling, proofing, relief systems –relief valves, flares, scrubbers.

UNIT III

ELECTRICAL HAZARDS

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications excess energy-current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity – definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc-ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation–earthing, specifications, earth resistance, earth pit maintenance.

UNIT – IV

LEAKS AND LEAKAGES

Spill and leakage of liquids, vapors, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and dispersion. Naturally buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mitigation measures for leaks and releases.

UNIT V

CASE STUDIES

Flixborough, Bhopal, Texas, ONGC offshore, HPCL Vizag and Jaipur IOC oil-storage depot incident; Oil, natural gas, chlorine and ammonia storage and transportation hazards.

Text Book

1. Fordham Cooper, W., "Electrical Safety Engineering" Butterworth and Company, London, 1986.

Reference Books

1. Crowl D.A. and Louvar J.F., "Chemical Process Safety: Fundamentals with Applications", 2nd Ed., Prentice Hall.2001
2. Mannan S., "Lee's Loss Prevention in the Process Industries", Vol.I, 3rdEd., Butterworth-Heinemann.2004.
3. Mannan S., "Lee's Loss Prevention in the Process Industries", Vol.II, 3rdEd., Butterworth-Heinemann.2005.
4. Indian Electricity Act and Rules, Government of India.
5. Power Engineers –Handbook of TNEB, Chennai, 1989.
6. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt.LTd., England, 1988.

16CS3123 – JAVA PROGRAMMING
(Open Elective - I)

III Year B.Tech I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. Understand basic concepts of object oriented programming.
2. Understand the primitive data types built into the Java language and features of strongly typed language.
3. Understanding scope, lifetime, and the initialization mechanism of variables and parameter passing mechanisms.
4. Understand file streams and database connectivity using Java language

Course Outcomes (COs)

After completion of the course, student would be able to

CO1. Apply the concepts of OOPs in problem solving.
CO2. Use data abstraction, inheritance, polymorphism, encapsulation and method overloading principles in structuring computer applications.
CO3. Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO4. Use Java standard class library with necessary exception handling mechanisms in constructing computer applications.
CO5. Develop java programs using multi-threading, files and database concepts and their connectivity.

UNIT-I

Object Oriented Characteristics - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, procedural and Object oriented programming paradigms.

Java Programming - History of Java, comments, data types, variables, constants, scope and life time of variables.

UNIT-II

Operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow block scope, conditional statements, loops break and continue statements. simple java program, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access control, this keyword, overloading methods and constructors recursion, garbage collection, building strings, exploring string class.

UNIT-III

Interfaces - Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Inner classes - Uses of inner classes, local inner classes, anonymous inner classes, static inner classes, examples.

Packages - Definition, Creating and Accessing a package, understanding CLASSPATH, importing packages.

UNIT –IV

Exception handling – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multi-Threading - Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication, producer consumer pattern.

UNIT –V

Files: streams – byte streams, character streams, text input/ Output binary input/ output
Random access file operations, file management using File class.

Connecting to Database - JDBC type 1 to 4 drivers, connecting to a data base, querying a data base and processing the results, updating data with JDBC.

TEXT BOOK(S)

1. Java fundamentals- A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH, 1st Edition, 2013.

REFERENCE BOOK(S)

1. Core Java 2–Volume1, Cay S. Horstmann and Gary Cornell
2. Java for Programmers, PJ. Dietel and H.M Deitel Pearson education.
3. Object Oriented Programming through Java. P.Radha Krishna. Universities Press.
4. Thinking in Java, Bruce Eckel, Pearson Education.

16ME3125– NANO MATERIALS and TECHNOLOGY
(Open Elective - I)

III Year B.Tech I Sem

L	T	P/D	C
3	0	-/-	3

Pre-requisites: None

Course Objectives:
1. This course is primarily intended to expose the students to a highly interdisciplinary subject
2. To enable the students understand the basic concepts of Nanotechnology
3. To enhance the knowledge of students in nanomaterials
4. To familiarize the students with the properties of nanomaterials and their applications
5. To expose the students MEMS / NEMS devices and their applications

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

CO1 Able to design a component / material that would provide us a " better tomorrow" via Nanotechnology
CO2 Understand synthesis and properties of nanostructured materials.
CO3 Analyze magnetic and electronic properties of quantum dots
CO4 Understand structure, properties and applications of Carbon nanotubes.
CO5 Understand applications of nanoparticles in nanobiology and nanomedicine

UNIT I
Introduction: Importance of Nano-technology, Emergence of Nano-Technology, Bottom-up and Top-down approaches, challenges in Nano Technology.

UNIT II
Zero Dimensional Nano-structures: Nano particles through homogenous nucleation; Growth of nuclei, synthesis of metallic Nano particles, Nano particles through heterogeneous nucleation; Fundamentals of heterogeneous nucleation and synthesis of nano particles using micro emulsions and Aerosol.

UNIT III
One Dimensional Nano-structures: Nano wires and nano rods, Spontaneous growth: Evaporation and condensation growth, vapor-liquid-solid growth, stress induced recrystallization.
Template based synthesis: Electrochemical deposition, Electro-phoretic deposition. Electro-spinning and Lithography.

UNIT IV
Two dimensional Nano-Structures: Fundamentals of film growth. Physical vapour Depostion (PVD): Evaporation molecular beam epitaxy (MBE), Sputtering, Comparison of Evaporation and sputtering.
Chemical Vapour Deposition (CVD): Typical chemical reactions, Reaction kinetics, transportant phenomena, CVD methods, diamond films by CVD.

UNIT V: Thin films: Atomic layer deposition (ALD), Electrochemical deposition (ECD), Sol-Gel films.
Special Nano Materials: Carbon fullerence and nano tubes: carbon fullerness, formation, properties and applications. Carbon nano tubes: formation and applications.

Text books:
1. Guozhong Cao - Nano structures and Nano materials: Synthesis, properties and applications - Imperial College press in 2004, 2nd edition.
2. Rechard Booker and Earl Boysen, Nanotechnology, Willey, 2006.

References:
1. T. Pradeep, Nano: The Essentials; Tata McGraw-Hill, 2008.
2. W.R. Fahrner, Nanotechnology and Nanoelectronics; Springer,2006.

16CE3126 – GLOBAL WARMING AND CLIMATE CHANGE
(OPEN ELECTIVE – I)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech I Sem
Prerequisite(s): None.

Course Objectives:
Develop ability to
1. Understand the importance of Ozone layer in the atmosphere.
2. Comprehend composition of atmosphere.
3. Understand impacts of climate change on ecosystem.
4. Understand initiatives taken by different countries to reduce emission of greenhouse gases.
5. Know measures to mitigate greenhouse gases.

Course Outcomes:
At the end of the course, student would be able to
CO 1: Define greenhouse gases and their influence on global warming.
CO 2: Explain physical and chemical characteristics of atmosphere and structure of atmosphere. .
CO 3: Explain impacts of climate change on agriculture, forestry and ecosystem.
CO 4: Explain initiatives taken by countries to reduce global warming.
CO 5: Suggest mitigation measures taken to reduce global warming and climate change.

UNIT–I
Earth's Climate System: Role of ozone in environment - Ozone layer – Ozone depleting gases – Green House Effect – Radioactive effects of Greenhouse gases – The Hydrological cycle – Green House Gases and Global Warming – Carbon Cycle.

UNIT–II
Atmosphere and Its Components: Importance of Atmosphere – Physical and chemical characteristics of Atmosphere – Vertical structure of the atmosphere – Composition of the atmosphere – Atmospheric stability – Temperature profile of the atmosphere – Lapse rates – Temperature inversion – Effects of inversion on pollution dispersion.

UNIT–III
Impacts of Climate change: Causes of Climate change: Changes of Temperature in the environment – Melting of ice pole – sea level rise – Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for different regions – Uncertainties in the projected impacts of Climate Change – Risk of Irreversible Changes.

UNIT–IV

Observed changes and its Causes: Climate change and Carbon credits – CDM – Initiatives in India-Kyoto Protocol – Paris Convention - Intergovernmental Panel on Climate change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Global Climate Models (GCM) - Evidences of Changes in Climate and Environment- on a Global scale and in India.

UNIT–V

Climate change and mitigation measures: Clean Development Mechanism – Carbon Trading – Examples of future clean technology – Biodiesel – Natural Compost – Eco-friendly plastic – Alternate Energy – Hydrogen – Bio-fules – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry – Carbon sequestration – Carbon capture and storage (CCS) – Waste (MSW & Bio-waste, Biomedical, Industrial waste) – International and Regional cooperation.

Text Books:

1. Climate Change: An Indian Perspective (Environment and Development), Dr. Sushil Kumar Dash, Cambridge University Press India Pvt Ltd, 2007.
2. Adaptation and mitigation of climate change – Scientific Technical Analysis, Cambridge University Press, Cambridge, 2006.

Reference Books:

1. Atmospheric Science, J.M. Wallace and P.V Hobbs, Elsevier/ Academic Press, 2006.
2. "Climate Change and Climate Variability on Hydrological Regimes", Jan C. Van Dam, Cambridge University Press, 2003.
3. **http://www.ipcc.ch/**

16EC31L1 – MICROPROCESSORS AND MICROCONTROLLERS LAB

III Year B.Tech I Sem

L	T	P/D	C
-	-	3 / -	2

Prerequisite(s):16EC2103 – Switching Theory and Logic Design

Course Objectives:
Develop ability to:
1. Write Assembly Language Programs for various arithmetic and logical operations using 8086.
2. Interface various I/O devices to 8086 processor kits.
3. Write Assembly Language Programs for various arithmetic and logical operations using 8051.
4. Interface various I/O devices to 8051 microcontroller kits.
5. Write and execute interfacing programs in Assembly Language for 8086 processor and 8051 microcontroller.

Course Outcomes:
At the end of the course, student would be able to:
CO1. Write programs in assembly language using the instruction set of 8086 through MASM software as well as using 8086 Kit.
CO2. Interface different I/O devices with 8086 and establish communication between them.
CO3. Write programs in assembly language using instruction set of 8051 and execute the same.
CO4. Verify the operations of the timer, counter and serial port (UART) of 8051.
CO5. Interface different I/O devices with 8051 and establish communication between them.

List of experiments: (Minimum 12 experiments are to be conducted using MASM/ Keil softwares and/or Hardware Kits).

Part A:

8086: Kit and/or MASM Programming (Minimum 4 experiments to be conducted)
1. Programs for 16 bit arithmetic operations (using various addressing modes)
2. Program for sorting an array
3. Program for searching for a number or character in a string
4. Program for String manipulations
5. Program to generate Fibonacci Series

Interfacing with 8086 Microprocessor: (Minimum 3 experiments to be conducted)
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Verification of various modes of operation of 8255.

Part B: (Minimum 5 experiments to be conducted)

8051: Kit and/or Keil Programming

10. Programming using arithmetic, logical and bit manipulation instructions of 8051
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. Verification of UART operation in 8051.

Interfacing with 8051 Microcontroller

14. Communication between 8051 kit and PC.
15. Interfacing Keyboard/Display to 8051.

Additional Experiments:

1. Interfacing LCD to 8051.
2. Wave form generation using Keil.
3. Programs using DOS/BIOS interrupts.

Equipment Required:

1. 8086 Trainer Kits.
2. 8051 Trainer Kits.
3. Interface cards :
    - 8 bit ADC & DAC,
    - Experimental card for 8051,
    - 8251/8253 study cards,
    - Keyboard/Display,
    - LCD Display,
    - 8255 Study card

Software Required:

4. MASM
5. Keil µVision5

16EC31L2 - IC APPLICATIONS AND HDL SIMULATION LAB

III Year B.Tech I-Sem

L	T	P/D	C
-	-	3 / -	2

Prerequisite(s): **16EC2103 - Switching Theory and Logic Design**
16EC21L1- Electronic Devices and Circuits Lab

Course Objectives:
Develop ability to:

1. Design circuits using OPAMP-uA741, Voltage Regulators using 723, 7805, 7809, 7912, and Astable and Monostable multivibrators using 555 timer ICs.
2. Design Digital Circuits using TTL 74XX series
3. Generate HDL code to design simple combinational and sequential circuits

The laboratory course aims at making the student familiar with various Analog ICs (in Part A) namely: linear ICs such as μA741, SE/NE 555, IC 565, IC Voltage Regulator 723 and functionality of a variety of Digital TTL 74XX ICs (in Part B).

Course Outcomes:
At the end of the course, the Students will be able to design and implement:
CO 1. Linear analog circuits using IC 741
CO 2. Wave shaping circuits employing Timer IC 555
CO 3. Voltage regulators using IC 723.
CO 4. Frequency Multiplier using PLL IC 565
CO 5. Combinational and sequential circuits using TTL 74XX series.

Note: Minimum 12 experiments are to be conducted (Minimum 4 experiments from each part are to be conducted)

PART – A (minimum 7 experiments)
Design and Verify the functionality of the following:

1. Inverting and Non-inverting Amplifiers using OPAMP IC 741.
2. Summing and Difference Amplifier using OPAMP IC 741.
3. Integrator Circuit and Differentiator circuit using OPAMP IC 741.
4. Active Filters – Butterworth LPF and HPF (second order) using OPAMP.
5. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
6. Mono-stable Multivibrator and Astable Multivibrator using IC 555.
7. Schmitt Trigger Circuits – using IC 741.
8. Design of Frequency Multiplier using PLL IC 565
9. Design of Low and High Voltage Regulators using IC 723

PART – B (minimum 3 experiments)

Design the following combinational and sequential circuits using TTL 74XX Series ICs:

1. Full adder/subtractor using decoders IC 74138 or IC 74328
2. Designing a 8:1 MUX using 4:1 MUXs or 2:1 MUXs
3. **Divide by N** counter using two 7490 ICs
4. Universal Shift register (preferably 4-bit and above)
5. Shift Register Counter (Johnson and Ring Counters)

Note: It's suggested that the student be asked to generate clock (1Hz or whatever) for experiments 3, 4 and 5 (in Part-B) using IC 555 Timer, instead of using Function Generator

PART – C (minimum 2 experiments using Verilog HDL)

1. Simulation of logic gates – OR, AND, NOT, NAND, NOR, XOR, XNOR
2. Simulation of Half-Adder and Full-Adder
3. Simulation of 8x1 MUX and 1x8 DEMUX.

Suggested Additional Experiments:

1. OPAMP characteristics and parameter measurement

2. Weighted resistor 4-bit DAC using IC 741

3. Priority Encoder using 74XX Series.

4. Simulation of Synchronous up-down counter.

Equipment required:

For Part - A

1. Regulated Power Supply (0-30V)
2. Cathode Ray Oscilloscope (20MHz)
3. Multimeters
4. Kits for the above experiments or the following components
   a. ICs- 741, 555, 723, 7805, 7809, 7912.
   b. Resistors, capacitors.
   c. Breadboards

For Part – B

TTL ICs – 74LS74, 74LS73, 74LS90, 74LS192, 74LS195/195, 71LS138, 74LS85, 74151 and 74155.

For Part – C : Computer with Xilinx software.

16EN31L1 - ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III Year B.Tech I-Sem

L	T	P/D	C
-	-	3 / -	2

Course objectives:

Develop ability to:

1. Improve the students' fluency in English, through a well developed vocabulary and enable them to listen to English spoken at normal conversational speed and respond appropriately in different socio-cultural and professional contexts.
2. Communicate their ideas relevantly and coherently in writing.
3. Prepare them for their placements.

Course outcomes:

At the end of the course, students would be able to:

1. Accomplish fluency in English vocabulary and use it contextually.
2. Develop academic and professional writing skills.
3. Improve or enhance job prospects
4. Inculcate employability skills.

S.NO		NAME OF THE EXERCISE
1.	Activities on Vocabulary Building.	Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations and usage of vocabulary.
2.	Activities on Fundamentals of Inter-personal Communication	Strategies for good Communication and focus on body language-Starting a Conversation-responding appropriately and relevantly- formal & informal conversation, Communication in different situations.
3.	Resilience and Personal Management	Managing stress, time, anger and other emotions, assertiveness and culture shock
4.	Activities on Group Discussion	Dynamics of Group Discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics of evaluation.
5.	Activities on Writing	Writing process, gather information, formatting, editing, types of essays, SOP. Portfolio writing- planning for writing- improving one's writing, brochures and newsletters.

6.	Activities on Interview Skills	Concept and process, Pre-interview planning, opening strategies, answering strategies, interview through Tele-conference & video-conference and Mock interviews, Videos of Mock Interviews.
ADDITIONAL EXERCISES		
1	Cross-Cultural Communication-Accepting and understanding various cultures.	
2	Attitude - towards work, what is a profession?, who is a professional?, what is professionalism? and positive thinking,	

Books recommended

1. Technical communication by Meenakshi Raman & Sangeetha Sharma, Oxford University Press, 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D. Pearson Education, 2011.
3. Technical Communication by Paul .V. Anderson. 2007. CENGAGE Learning Pvt Ltd., New Delhi.
4. Business And Professional Communication by Keys for Work place Excellence by Kelly M Quintanilla& Shawn T. Wahi . Sage South Asia Edition. Sage publication, 2011.
5. The Basics of Communications: A Relational Perspective by Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications, 2012.
6. English Vocabulary in Use series, Cambridge University Press 2008.
7. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayath Nagar Hyderabad, 2008.
8. Handbook for Technical Communication by David A Mc Murrey & Jaoanne Buckely, 2012. CENGAGE learning.
9. Communication Skills by Leena Sen , PHI Learning pvt ltd, New Delhi 2009.
10. Handbook for Technical Writing by David A Mc Murrey & Joanne Buckely CENGAGE learning, 2008.
11. Job hunting by Colm Downes , Cambridge University Press, 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students by Aysha Viswamohan, Tata Mc Graw- Hill, 2009.
14. Books on TOEFL/ GRE/GMAT/CAT/ IELTS by Barron's / DELTA / Cambridge University Press.
15. International English for Call Centers by Barry Tomalin and Suhashini Thomas , Macmillanpublishers2009.

16MA31P1 – LOGICAL REASONING

III Year B.Tech I Sem
Prerequisite(s): None

L	T	P/D	C
-	-	2/-	1

Course Objectives:
Develop ability to

1. Understand and compute LCM, HCF, Square Roots & Cube Roots.
2. Calculate averages; solve problems on time, distance and work done.
3. Understand relation between capital investment, period of investments and shares.
4. Think analytically and logically to solve a given problem.
5. Understand concepts of clocks and calendars.

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

CO 1: Apply cogent methods to evaluate LCM, HCF, Square Roots & Cube Roots.
CO 2: Apply various principles to solve mathematical problems on time, distance and work done involving lesser computations.
CO 3: Apply relation between Capital investments, period of investments and shares to solve numerical problems which involves shorter computational time.
CO 4: Demonstrate analytical and logical thinking by solving various problems which include relations and puzzle solving abilities.
CO 5: Solve problems related to time.

UNIT-I
Numbers- Classification of numbers, Divisibility rules, Finding the units digit, Finding remainders in divisions involving higher powers, LCM and HCF Models**,** Decimal fractions, Simplifications, Square Roots & Cube Roots, Surds and Indices.

UNIT- II
Averages-Definition of Average, Rules of Average, Problems on Average, Problems on Weighted Average, Finding average using assumed mean method**.**
Time and Distance- Relation between speed, distance and time, Converting kmph into m/s and vice versa, Problems on average speed, Problems on relative speed, Problems on trains.
Time and Work- Problems on Unitary method, Relation between Men, Days, Hours and Work, Problems on Man-Day-Hours method, Problems on alternate days, Problems on Pipes and Cisterns.

UNIT-III:

Partnership- Introduction, Relation between capitals, Period of investments and Shares.

Simple Interest- Definitions, Problems on interest and amount, Problems when rate of interest and time period are numerically equal.

Compound Interest-Definition and formula for amount in compound interest, Difference between simple interest and compound interest for 2 years on the same principle and time period.

UNIT – IV

Analytical Reasoning puzzles- Problems on Linear arrangement, Problems on Circular arrangement, Problems on Double line-up, Problems on Selections, Problems on comparisons.
Blood relations- Defining the various relations among the members of a family, Solving Blood Relation puzzles, Solving the problems on Blood Relations using symbols and notations.

UNIT – V

Clocks - Finding the angle when the time is given, Finding the time when the angle is known, Relation between Angle, Minutes and Hours, Exceptional cases in clocks.
Calendars - Definition of a Leap Year, Finding the number of Odd days, Framing the year code for centuries, Finding the day of any random calendar date.
Odd man out- Problems on number Odd man out, Problems on letter Odd man out, Problems on verbal Odd man out.

Text Books:
1. Quantitative Aptitude for Competitive Examinations by R.S. Aggarwal, S Chand Publication.
2. Quantitative Aptitude for Competitive Examination by Abhijit Guha, McGraw Hill Education.

Reference Books:
1. Quantitative Aptitude for the CAT by Nishit K. Sinha, Pearson Education
2. Wiley's Quantitative Aptitude by P.A. Anand, Wiley; First Edition.

16EC3201 - DIGITAL SIGNAL PROCESSING

L	T	P/D	C
3	1	-/-	3

III year B.Tech II-Sem

Prerequisites: 16EC2102 - Theory of Signals and Systems

Course Objectives:

Develop ability to:

1. Understand fundamental concepts involved in the analysis and processing of digital signals.
2. Distinguish between continuous-time and discrete-time signals and systems.
3. Understand fundamental concepts of time and frequency domains, Z-plane analysis and their inter-relationships using analytic methods.
4. Design digital filters: Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) for a given specification.
5. Understand implementation of Fast Fourier Transform (FFT) algorithms, Multi-rate signal processing techniques and finite word length effects.

COURSE OUTCOMES:

On the completion of this course, student would be able to:

CO 1. Perform analysis on signals and systems in time and frequency domains and Z-plane.
CO 2. Analyze the relationship between DFT and various Transforms.
CO 3. Mathematically model various filter structures along with effects of rounding-off errors.
CO 4. Design IIR and FIR filters for given specifications.
CO 5. Compute FFT for a given sequence.
CO 6. Distinguish between normal and multi rate DSP techniques and finite word length effects.

Unit-I

Introduction to Digital Signal Processing Review of Discrete time signals and sequences; Analog to Digital Conversion process, Sampling of Low Pass and Band Pass Signals.

Analysis of Discrete Time Invariant Systems: Causal Linear Time Invariant Systems (LTI), Stability of LTI Systems, LTI Systems characterized by constant co-efficient difference equations, Solution of Linear Constant Co-efficient difference equations. LTI Systems; Digital Signal Processing and its benefits; Review of Z-transforms;

Frequency analysis of discrete time signals: The Fourier Series for discrete time periodic signals, Relation between Z-transform and Discrete Fourier Series.

UNIT II

Discrete Fourier Transform (DFT): Its properties and applications, Relationship of DFT to other (DTFS and Z-Transforms) transforms, Inverse Discrete Fourier Transform (IDFT), linear convolution of sequences using DFT, Computation of DFT and IDFT.

Fast Fourier Transform (FFT): Efficient computation of DFT: FFT Algorithms, Direct computation of DFT, Radix-2 FFT algorithms for decimation in time and decimation in frequency. Divide and conquer approach to computation of DFT (Radix-N FFT algorithm).

UNIT- III

Design of DIGITAL FILTERS (IIR) - Structures of IIR systems:

Direct Form I and II, Cascade form and Parallel form structures, Design of IIR Filters from analog filters: Characteristics of commonly used analog filters, Analog filter approximations- Butterworth and Chebyshev. IIR filter design by Impulse invariance, Bilinear Transformation method, Frequency transformations.

UNIT-IV

Design of DIGITAL FILTERS (FIR) - Structure of FIR Systems:

Direct form, Cascade realization and Linear phase realization; Characteristics of linear phase FIR filter and its frequency response; Comparison of IIR and FIR filters; Design of linear phase FIR filters using windows method (Rectangular window, Hanning window, Hamming window, Bartlett window and Kaiser window), frequency-sampling method.

UNIT-V

Introduction to Multirate Digital Signal Processing: Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D. Multistage implementation of sampling rate conversion. Application of multirate signal processing. Introduction to Finite word length effects in fixed point DSP System. Introduction to Time Frequency Analysis and its applications: Radar, Speech and Image Processing

TEXT BOOKS

1. Digital Signal Processing: Principles, Algorithms and Applications – John G.Proakis, D.G.Manolakis, 4th Edition, Pearson/PHI, 2009.
2. Digital Signal Processing – A Pratical Approach – Emmanuel C.Ifeacher, Barrie. W.Jervis, 2nd Edition, Pearson Education, 2009.

REFERENCES

1. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing- Fundamentals and Applications – Li Tan, Elsevier, 2008.
3. Fundamentals of Digital signal Processing using MatLab- Robert J.Schilling, Sandra L.Harris, Thomson, 2007.
4. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya,TMH, 2009.

16EC3202 - DIGITAL COMMUNICATIONS

III year B.Tech II-Sem

L	T	P/D	C
3	1	-/-	3

Prerequisites:

16EC2102 - Theory of Signals and Systems
16EC2204- Analog Communications
16EC2103- Switching Theory and Logic Design

Course Objectives:
Develop ability to:

1. Understand different digital coding techniques such as PCM, DM, DPCM and various digital modulation techniques namely ASK, FSK, BPSK and QPSK.
2. Analyze different Digital Baseband Transmission techniques.
3. Understand the concepts of Error Correction codes namely, Block codes, Cyclic code and convolution Codes.
4. Understand the characteristics of Spread Spectrum (SS) modulation techniques.

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

1. Explain basic components of digital communication systems and various Digital Modulation techniques.
2. Analyze and apply various Line coding techniques needed for Base Band Transmission.
3. Explain source coding techniques in base band transmission systems.
4. Apply different error detecting and error correcting methods in digital communication systems.
5. Apply Spread Spectrum techniques in digital communication systems.

UNIT I

Elements of Digital Communication Systems

Introduction to Digital Communication Systems: Model of Digital Communication System, Digital Representation of Analog Signal, Sampling Theorem, Advantages of Digital Communication Systems.

Baseband transmission and Optimal Reception of Digital Signals:
A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, Matched filtering, Signal Space Representation and Probability of Error, Cross Talk.

Waveform Coding Techniques : Concept of Quantization, Quantization noise, Non uniform Quantization and Companding, Pulse Code Modulation- PCM Generation and Reconstruction, PCM, Adaptive DPCM, DM and Adaptive DM. Noise in PCM and DM, Comparison of various Coding Techniques.

UNIT II

Information Theory: Information and Entropy, Conditional and Joint Entropies, Mutual Information, Information loss due to noise, Types of Channels and Channel Capacity, Bandwidth-S/N tradeoff, Hartley Shannon Law.

Source Coding Techniques: Need of Source Coding, Various types of Source Codes, The Kraft Inequality Condition, Entropy, Entropy Coding -- Shannon- Fano coding, Huffman Code, Source coding to increase average Information per bit. Lossy Source coding.

UNIT III: Error Detection and Correction Codes

Linear Block Codes: Matrix description of Linear Block Codes, Error detection and error Correction capabilities of linear block codes, Error detection and Correction using Hamming Code, Hamming Encoder, Syndrome technique, Syndrome Decoder.
Cyclic Codes: Algebraic structure, encoding, syndrome calculation. Decoding.
Convolution Codes: State, tree and trellis diagrams, Encoding of Cyclic Codes, Decoding using Viterbi algorithm.

UNIT IV: **Digital Modulation Techniques**

Introduction to Digital modulation techniques, ASK, ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, FSK, Bandwidth and Frequency Spectrum of FSK. Non coherent FSK Detector, Coherent FSK Detector, FSK Detection Using PLL, BPSK, Coherent PSK Detection, QPSK, Differential PSK, MSK, Eye Diagrams, Performance comparison of various techniques.

UNIT V: Spread Spectrum Modulation

Spread Spectrum Modulation: Need of Spread Spectrum Modulation, Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access, Ranging using DSSS. Frequency Hopping Spread Spectrum, PN - sequences: Generation and Characteristics. Synchronization in Spread Spectrum Systems

TEXT BOOKS:

1. Digital Communication - Simon Haykin, Jon Wiley, 2005.
2. Digital and Analog Communicator Systems - Sam Shanmugam, John Wiley, 2005.
3. Principles of communication systems - Herbert Taub. Donald L Schiling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008.

REFERENCE BOOKS:

1. Digital Communications - John G. Proakis . Masoud salehi – 5th Edition, McGraw-Hill, 2008.
2. Digital Communications - Ian A. Glover, Peter M. Grant, Edition, Pearson Edu., 2008.
3. Communication Systems-B.P. Lathi, BS Publication, 2006.
4. Digital Communications – Sanjay Sarma , SKK Publications, 2011.
5. Digital Communication – J S Chitodi, Technical Publications.

16EC3203 - CONTROL SYSTEMS ENGINEERING

III Year B.Tech E II sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16EC2102 - Theory of Signals and Systems
16EE2103- Electrical circuits and Electrical Technology

Course Objectives:
Develop ability to:

1. Understand the principles and applications of control systems in everyday life.
2. Understand the basic concepts of block diagram reduction methods and signal flow graph techniques.
3. Understand time domain analysis of time invariant systems.
4. Understand different aspects of stability analysis of systems in frequency domain and time domain.
5. Understand the differences of conventional control theory and modern control theory.

Course Outcomes:

After the completion of the course, student would be able to:

1. Deduce transfer function representation through block diagram algebra and signal flow graphs.
2. Determine time response analysis of systems through their characteristic equation and time-domain specifications.
3. Analyze the stability of control systems through R-H criteria, root-locus, bode diagrams, Nyquist criterion and polar plots.
4. Design PID controllers, lag, lead, lag-lead compensators.
5. Apply state space approach to control system analysis.

UNIT –I

Introduction:

Concepts of Control Systems- Open Loop and closed loop control systems and their differences - Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback, Mathematical models – Differential equations, Impulse Response and transfer functions. Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason‘s gain formula.

UNIT –II

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT –III

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

UNIT –IV

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots – Stability Analysis. Compensation techniques – Lag, Lead and Lead - Lag Controllers design in frequency Domain, PID Controllers.

UNIT –V

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

TEXT BOOKS:

1. Control Systems Engineering - I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 4th Edition, 2005
2. Automatic Control Systems – BC Kuo, 7th Edition, PHI, 2003

REFERENCE BOOKS:

1. Control Systems Theory and Applications - S.K Bhattacharya, Pearson.
2. Control Systems - N.C.Jagan, BS Publications.
3. Control systems - A.Anand Kumar, PHI.

16EC3204 - ELECTRONIC INSTRUMENTATION AND MEASURMENTS
(Professional Elective – I)

III Year B.Tech II- Sem

L	T	P/D	C
3	1	-/-	3

Pre-requisite(s): 16EC2101 - **Electronic Devices and Circuits**
16EC2102 - **Theory of signals and systems**
16EC2201 - **Pulse, Digital and Switching Circuits**

Course Objectives:

Develop ability to:

1. Understand functioning of various measuring systems and metrics for performance analysis.
2. Understand the principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. Understand various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:

On completion of this course, student would be able to:

1. Select a suitable electronic instrument for specific measurement function(s).
2. Select a transducer as per the application requirement.
3. Explain functioning, specification and applications of signal generators, signal analyzers for generating and analyzing various real-time signals.

Unit-I

Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Unit-II

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

Unit-III

Measuring Instruments: DC Voltmeters, D'Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, rue RMS Responding Voltmeter, Specifications of Instruments, CRO and its applications. **Digital Instruments:** Digital Voltmeters(DVMs) and Digital Storage Oscilloscope (DSO)

Unit-IV

Bridges: Introduction, DC Bridges: Wheatstone bridge and Kelvin bridge.
AC Bridges: Maxwell bridge, Hay bridge, Schering bridge, Wien bridge and Anderson bridge

Unit-V

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOKS:

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper, PHI 5th Edition 2003.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.

REFERENCES:

1. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.
2. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
3. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

16EC3205 -TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS
(Professional Elective – I)

III Year B.Tech II Sem

L	T	P/D	C
3	1	-/-	3

Prerequisites: 16EC2204 Analog Communication
16EC2103 Switching Theory and Logic design

Course Objectives:

Develop ability to:

1. Understand Basic Principles of Switching Systems namely, Strowger and Crossbar.
2. Distinguish Time division switching and Space division Switching Systems.
3. Design the Transmission plan, Charging Plan and Telecommunications Traffic.
4. Understand various Signaling techniques.
5. Analyze various Communication networks namely, Local- Area, Packet Switching Networks namely, Wide- Area Networks, Large-scale Networks, Broadband Networks , Rearrangeable Networks, Strict- Sense non-blocking Networks, Sectionalized Switching Networks.
6. Understand the Standards and principles of ISDN.

Course Outcomes:

After completion of this Course, the Student would be able to:

1. Explain the Basic Principles of the different Switching Systems.
2. Analyze and distinguish the Space Division and Time Division Switching techniques.
3. Design Transmission Plan and Charging Plan and analyze the Telecommunication Traffic.
4. Analyze various Signaling techniques.
5. Analyze the operation of various Switching Networks.
6. Explain the Basic Standards and operation of ISDN.

UNIT -I

Introduction: Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication Networks, Strowger Switching System.

Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT -II:

Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks, n- Stage Networks.

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three Stage Combination Switching, n- Stage Combination Switching.

UNIT -III:

Telephone Networks: Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling.

Signaling: Introduction to signaling, CCITT Signaling System no.6, CCITT Signaling System no.7.

UNIT -IV:

Switching Networks: Statistical Multiplexing, Local- Area and Wide- Area Networks, Large-scale Networks, Broadband Networks, Concepts of X.25 Packet Switching Networks and Frame Relay in wide area networks.

UNIT -V:

Link Systems: Grades of Service of Link systems, Application of Graph Theory to Link Systems.

Telecommunications Traffic: Unit of Traffic, Congestion, Traffic Measurement, A Mathematical Model, Lost-call Systems, Queuing Systems.

Integrated Services Digital Network: Introduction, ISDN Standards, Broadband ISDN, Voice Data Integration.

Text Books:

1. Telecommunications Switching, Traffic and Networks- J. E. Flood, 2006, Pearson Education.
2. Data Communication & Networking- B. A. Forouzan, 3rd Edition, 2004, TMH.

Reference Books:

1. Digital Telephony- J. Bellamy, 2nd Edition, 2001, John Wiley.
2. Data Communications and Networks- Achyut S. Godbole, 2004, TMH.
3. Telecommunication System Engineering – Roger L. Freeman, 4th Ed., Wiley-Inter Science, John Wiley & Sons, 2004.
4. Telecommunication Switching Systems and Networks- Thiagarajan Viswanathan, 2000, PHI.

16EC3206 - DIGITAL SYSTEMS DESIGN
(Professional Elective – I)

III Year B.Tech II Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16EC2103 - Switching Theory and Logic Design.

Course Objectives: Develop ability to:

1. Understand the basic concepts of Finite state machine models and minimize state machines.
2. Understand and design Asynchronous sequential machines.
3. Understand Algorithmic State Machine charts and realize circuits.
4. Understand the concept of Fault diagnosis and identify various faults in digital systems

Course Outcomes:

At the end of the course, student would be able to:

CO 1. Apply state reduction techniques in the design of FSMs.

CO2. Design Asynchronous Sequential Machines

CO 3. Design Sequential circuits using ASM charts.

CO 4. Generate test patterns for detecting various faults in combinational and sequential circuits.

UNIT –I
Minimization and Transformation of Sequential Machines

The Finite State Model – Capabilities and limitations of FSMs – State equivalence and machine minimization – Simplification of incompletely specified machines – Merger graph and Merger Table

UNIT –II

Asynchronous Sequential Circuits

Fundamental mode circuits, Synthesis – Flow table, reduction of flow tables, State Assignment in Asynchronous sequential circuits – Races and cycles, Pulse mode circuits.

UNIT –III

State Machine Design with SM Charts

State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of Binary Divider, Binary Multiplier and Dice game controller using SM charts.

UNIT -IV

Fault Diagnosis of Digital Systems

Logic Fault model, Stuck at zero and Stuck at one faults. Fault detection in Combinational Circuits:
Fault Table method and Fault location experiment, Path sensitization technique and Boolean Difference method.

UNIT –V

Fault Diagnosis in Sequential Circuits

State Identification and Fault detection: Experiments, Homing experiments, Distinguishing experiments, Machine Identification and Design of diagnosable machines.

TEXT BOOKS:

1. Switching and Finite Automata Theory – Z. Kohavi, 2nd Ed., 2001, TMH
2. Fundamentals of Logic Design – Charles H. Roth, 5th Ed., Cengage Learning.

REFERENCE BOOKS:

1. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman- John Wiley & Sons Inc.
2. Digital Circuits and Logic Design – Samuel C. Lee, PHI
3. Logic Design Theory – N. N. Biswas, PHI
4. Digital Design – Morris Mano, M.D.Ciletti, 4th Edition, PHI.

16EC3207 - OPTICAL COMMUNICATIONS
(Professional Elective – II)

III Year B.Tech II Sem

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16EC2204 Analog Communications

Course Objectives:

Develop ability to

1. Understand the construction and characteristics of optical fibre cable.
2. Understand optical signal sources and power Coupling
3. Understand the operation of various optical detectors.
4. Design the optical systems.

Course Outcomes:

At the end of the course, student would be able to

CO 1. Explain and analyze the constructional parameters of optical fibres.
CO 2. Design an optical communication system.
CO 3. Analyze the losses due to attenuation, absorption, scattering and bending.
CO 4. Compare various optical detectors and choose suitable one for different applications.

UNIT -I:

Overview of Optical Fiber Communication: - Historical development of Optical Communication system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory - Transmission, Reflection, Skew Rays, Cylindrical Fibers- Modes, V number, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

UNIT -II:

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

UNIT -III:

Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints.

Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD, Power Coupling, Power Launching.

UNIT -IV:

Optical Detectors: Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation, Error Sources, Digital and Analog Receivers.

UNIT -V:

Optical System Design: Design Considerations, Component Choice, Multiplexing, Point-to-Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples, Introduction to WDM.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, TMH, 4th Edition, 2008.
2. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.

REFERENCES:

1. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

16EC3208 – COMPUTER ARCHITECTURE AND ORGANIZATION
(Professional Elective – II)

III Year B.Tech II Sem

L	T	P/D	C
3	1	- / -	3

Prerequisite(s): 16EC2103 – Switching Theory and Logic Design

Course Objectives: Develop ability to:

1. Understand the basic structure and operation of a digital computer.
2. Learn the operation of the arithmetic unit and algorithms for various operations.
3. Understand various instructions, Addressing modes and Instruction codes.
4. Learn different ways of communicating with I/O devices and standard I/O interfaces.
5. Understand the hierarchical memory system, cache memory and virtual memory.
6. Learn the concepts of pipelining and multiprocessing techniques.

Course Outcomes:

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

1. Explain Basic structure of a digital computer.
2. Demonstrate method of execution of Arithmetic operations on binary numbers.
3. Analyze the organization of the Control unit, Arithmetic, Logical unit, Memory unit and the I/O unit.
4. Explain Characteristics of multi-processors, pipelining concepts and vector processing.

UNIT I

BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers.

UNIT II

REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS: Register Transfer language. Register Transfer, Bus and memory transfer, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes, Computer Registers, Computer instructions, Instruction cycle, Memory Reference Instructions.

CENTRAL PROCESSING UNIT - Stack organization, Instruction formats, Addressing modes, Program control, Reduced Instruction set computer.

UNIT III

COMPUTER ARITHMETIC: Addition, subtraction, multiplication and Division Algorithms, Floating point Arithmetic operations.

INPUT-OUTPUT ORGANIZATION: Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input Output Processor (IOP), Serial communication

UNIT IV

MEMORY SYSTEM: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory.

UNIT V

PIPELINE AND VECTOR PROCESSING: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.
MULTI PROCESSORS: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration. Interprocessor Communication and Synchronization, Cache Coherence.

Text Books:

1. Computer System Architecture, M. Moris Mano, 3rd Edition, Pearson/ PHI, 2007
2. Computer Organization and Architecture, William Stallings 7th Edition, PHI/Pearson. 2006

References:

1. Computer Architecture and Organization, John P. Hayes., 3rd McGraw Hill International editions, 1998.
2. Computer Organization, Car Hamacher, Zvonks Vranesic, Safwat Zaky, 5th Edition, McGraw Hill. 2002

16CS3212 – COMPUTER NETWORKS
(Professional Elective – II)

L	T	P/D	C
3	1	-/-	3

III Year B.Tech II Sem

Prerequisite(s): None

Course Objectives:

Develop ability:

1. To explore various types of computer networks.
2. To compare the OSI and TCP/IP models with merits and demerits.
3. To explore various routing mechanisms in network-layer
4. To introduce UDP-and-TCP protocols in internet.

COURSE OUTCOMES

After completion of the course, student shall be able to

1. Identify the different types of network topologies and protocols.
2. Enumerate the layers of the OSI model and TCP/I reference models.
3. Understand the working functions of UDP and TCP Protocols in internet
4. Identify the different types of network devices and their functions within a network
5. Building the skills of sub-netting and routing algorithms.

UNIT-I

Overview of the Computer Networks : Introduction to network, Layering scenario, compare and contrast OSI and TCP/IP reference models, history of Internet.

Physical layer : Guided Media, Unguided Media,

Data Link Layer-design issues, Error Recovery mechanisms, CRC codes, Elementary Data link layer protocols, Sliding window protocol.

Case Study for LAN Establishing.

UNIT-II

Multiple Access protocol- ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac sub layer, datalink layer switching and use of bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers, and gateways.

UNIT-III

The Network Layer : Network layer design issues, store and forward packet switching connection less and connection oriented networks-Routing algorithms:-count-to-infinity problem.optimality principle, shortest path, flooding, Distance vector routing, Count to infinity problem, Hierarchical routing, congestion control algorithms, admission control.

Case Study: Use any Networking simulator and demonstrate DATA Transmission scenario (Ex.FTP)

UNIT-IV

Internetworking: Tunneling, Internetwork routing, packet fragmentation, IPV4, IPV6 protocol, IP addresses, Subnet-masking. CIDR, ICMP, ARP, RARP, DHCP.

The Transport Layer : Service provided to the upper layers elements of transport protocol-addressing connection establishment, connection release, Connection Release, crash recovery.

UNIT-V

The Internet Transport Protocols UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols-Introduction to TCP, The TCP Service model, The TCP Segment header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling, The future of TCP.

Application Layer- Introduction, Providing Services, Client Server model, standard client-sever application-HTTP, FTP, E--mail, TELNET, DNS, SSH

Text Book:

1. "Computer Networks", 5th edition, 2010, Andrew S. Tanenbaum, Wetherall, Pearson.

Reference Books:

1. "Data communications and networking" 5thedition, 2012, Behrouz A. Forouzan, TMH.
2. "Internetworking with TCP/IP –Principles, protocols, and architecture-Volume1, Douglas E. Comer, 5thedition, PHI
3. "Introduction to Computer Networks and Cyber Security", Chawan-HwaWu, Irwin, CRC Publications.
4. "Computer Networks and Internets with Internet Applications", Comer

16EC3209 - DIGITAL DESIGN THROUGH VERILOG HDL
(Soft Core – I)

III Year B.Tech II Sem

L	T	P/D	C
3	-	- / -	3

Prerequisite(s): 16EC2103 – Switching Theory and Logic Design

Course Objectives:
Develop ability to understand:
1. Different technologies related to Hardware Description Languages (HDLs).
2. Basics of Hardware Description Language constructs.
3. The process to compile and execute Verilog HDL programs.
4. Behavioural and RTL modelling of digital circuits using Verilog HDL.
5. The process in the design of digital circuits through Verilog HDL.

Course Outcomes:
At the end of the course, student would be able to:
CO1: Write Verilog Hardware Descriptive Language (HDL) programs using HDL Constructs.
CO2. Design, Implement and Verify Digital Circuits by developing HDL code.
CO3. Synthesize, Implement and Verify Behavioural and Register Transfer Level (RTL) models for Digital Circuits using Verilog HDL.
CO4. Synthesize, implement and verify Gate Level Models using Verilog HDL

UNIT I:
Introduction to Verilog HDL: Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools.
Language Constructs and Conventions: Introduction, Keywords, Identifiers, white space characters, Comments, Numbers, Strings, Logic values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.

UNIT II
Gate Level Modeling: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Design of Flip-flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuits.
Modeling at Data flow Level: Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.

UNIT III
Behavioral Modeling: Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-Blocking Assignments, The case statement, Simulation Flow if and if-else constructs, Assign-De-Assign construct, Repeat

construct, for loop, the Disable construct, While loop, Forever loop, Parallel Blocks, Force-Release construct, Event.

UNIT IV

System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT V

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

Text Books:

1. T R Padmanabhan, B Bala Tripura Sundari, Design through Verilog HDL, Wiley, 2009.
2. Zainalabdien Navabi, Verilog Digital System Design, TMH, 2nd Edition.

Reference Books:

1. Verilog HDL- Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
2. Advanced Digital Design with the Verilog HDL – Micheal D. Coletti, PHI, 2009.
3. Fundamentals of Digital Logic with Verilog Design – Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition, 2010.
4. Advanced Digital Logic Design using Verilog, State Machine and Synthesis for FPGA – Sunggu Lee, Cengage Learning, 2012.

16EC3210 - VLSI DESIGN
(Soft core – I)

L	T	P/D	C
3	-	- / -	3

III Year B.Tech II- Sem

Pre-requisite: 16EC2103 – Switching Theory and Logic Design
16EC2101- Electronic Devices and Circuits

Course Objectives:
Develop ability to understand:
1. Different steps involved in the fabrication of ICs using MOS transistor, CMOS/BiCMOS transistors and passive components.
2. Electrical properties of MOS and BiCMOS devices.
3. The design rules to be followed to draw the layout of any logic circuit.
4. The design flow of different types of logic gates using CMOS
5. The concepts involved in the design of the building blocks of data path of any system using gates.
6. Basic programmable logic devices and testing of CMOS circuits.

Course Outcomes:
At the end of the course, student would be able to:
1. Explain the fabrication process of integrated circuit using MOS transistors.
2. Choose an appropriate logic gate(s) based on the fan-out requirements of a circuit.
3. Draw the layout of any logic circuit which helps to estimate its parasitic capacitance.
4. Design different types of logic gates using CMOS circuits and analyze their transfer characteristics.
5. Design various building blocks of data path using gates.
6. Design simple memories using MOS transistors.
7. Design simple logic circuits using PLA, PAL, FPGA and CPLD using CMOS circuits.
8. Explain the test procedures involved in the testing of CMOS circuits using the concept of built-in-self-test (BIST).

UNIT –I:
Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS
Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit ω_o, Pass transistor, MOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT -II:
VLSI Circuit
Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT –III:

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT -IV:

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT -V:

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K.Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.

16EC32L1 - DIGITAL SIGNAL PROCESSING LAB

III year B.Tech II Sem

L	T	P/D	C
-	-	3 / -	2

Prerequisite(s): **16EC2102 - Theory of Signals and Systems**
16EC21L2 - Simulation Lab-I

Course Objectives: Employing MATLAB/SCILAB/OCTAVE/CC-Studio**,** develop ability to

1. **A**nalyze and display signals in the frequency-domain.
2. Perform spectral analysis using the DTFT, DFT FFT.
3. Write programs and use DSP hardware for various signal processing applications
4. Design FIR and IIR Filters for given specifications
5. Implement decimation, interpolation and sampling rate conversion

Course Outcomes

By the end of the course, students should be able to:

1. Develop and Implement DSP algorithms in software using floating point Processor.
2. Develop various DSP Algorithms using MATLAB/SCILAB/OCTAVE/CC-Studio Software.
3. Analyze Magnitude and phase characteristics of digital IIR and FIR filters.
4. Estimate power spectral densities of a discrete time sequence.
5. Estimate and remove noise using a variety of signal processing algorithms

Minimum 12 Experiments are to be conducted

The programs shall be implemented employing MATLAB/SCILAB/OCTAVE/CC-Studio or Equivalent in software and DSP processors kits in hardware.

1. Generation of Sinusoidal waveform / signal based on recursive difference equations.
2. To find DFT / IDFT of given DT signal.
3. To find frequency response of a given system given in (Transfer Function/ Differential equation form).
4. Implementation of FFT of given sequence.
5. Determination of Power Spectrum of a given signal(s).
6. Design and Implementation of LP FIR filters for given specifications.
7. Design and Implementation of HP FIR filters for given specifications.
8. Design and Implementation of LP IIR filters for given specifications.
9. Design and Implementation of HP IIR filters for given specifications.

10. Time frequency analysis of a given non-stationary signal.
11. Design a FIR Filter using the following windows and compare their finite word length effects.
    a. Rectangular window
    b. Hamming window
    c. Hanning window
    d. Kaiser window
12. Implementation of Decimation Process.
13. Implementation of Interpolation Process.
14. Implementation of I/D sampling rate converters.
15. Noise removal: Add white noise to a signal and study their spectral characteristics and then remove the noise.
16. Impulse response of first order and second order systems.

Additional Experiments

1. Reading a speech waveform and plot its frequency spectrum by using **WaveSurfer** (a freeware software) or by using MATLAB.
2. CD data to DVD data conversion.

16EC32L2 - DIGITAL DESIGN THROUGH VERILOG HDL LAB
(Soft Core –I Lab)

III Year B.Tech II Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): 16EC2103 – Switching Theory and Logic Design
16EC31L2 – IC Applications and HDL Simulation Lab

Course Objectives:

Using Verilog HDL, develop ability to:

1. Understand, describe, simulate and synthesize combinational logic circuits.
2. Understand, describe, simulate and synthesize sequential logic circuits.
3. Understand, describe and simulate logic circuits - gate level, data-flow and behavioural modelling.
4. Understand, describe and simulate User Defined Primitives (UDPs).
5. Implement an idea based on FSM (Mealy and Moore Machines).

Course Outcomes:

After completion of course the student would be able to:

CO 1. Design combinational and sequential logic circuits.
CO 2. Develop HDL code using Verilog HDL for combinational and sequential logic circuits.
CO 3. Simulate and Synthesize HDL Code using EDA Tools for gate level, data-flow and behavioural modelling.
CO 4. Simulate UDPs using Verilog HDL
CO 5. Develop code for a FSM based design (Mealy or Moore Machine) using Verilog HDL.

List of Experiments: (Minimum 12 experiments are to be conducted).

1. Design a Verilog module of full adder module using half adder module and OR gate primitive.
2. (a) Design a Verilog module to generate Excess-3 code of 4-bit output from a BCD code.
   (b) Design a Verilog module to generate BCD code of 4-bit output from a Excess-3 code.
3. Use the 2 to 4 decoder module and prepare
   a) 4 to 1 Multiplexer module.
   b) 1 to 4 demultiplexer module.
4. Design a Verilog module of the flip-flops (Clocked RS, Clocked D, Clocked JK and Clocked T) using universal gates.
5. Design a Verilog module using continuous assignment statements for the following:
   a) Parity Generator
   b) 7 segment decoder
6. Design a Verilog module of 4 bit comparator.
7. Design a Verilog module for swapping variable values using:
   a) Blocking assignments.
   b) Non-blocking assignments.
8. Design a Verilog module for priority encoder using casex constructs.
9. Design a Verilog module for 3-bit binary adder.

10. Design a Verilog module to design NOT, NAND, NOR, OR and AND gates using switch level modeling.
11. Form a UDP for a 4 to 1 multiplexer.
12. Form a UDP for an positive edge triggered D-flip-flop.
13. Design of 4-bit Binary, BCD Counters (Synchronous/ Asynchronous Reset).
14. Design of Sequence Detector (Finite State Machine- Mealy and Moore Machines).

Additional Experiments:

1. Design of a 4-bit Shift Register of Serial in Serial out, Serial in Parallel out, Parallel in, Serial out, and Parallel in Parallel Out.
2. Design of 4-bit Ring and Johnson Counters.

Software Required:

1. Xilinx Or ModelSim
(Programming can be done using any HDL Complier (Verilog HDL))

Hardware Required:
1. PCs.

16EC32L3 - VLSI LAB
(Soft Core- I Lab)

III Year B.Tech. II-Sem

L	T	P/D	C
-	-	3/-	2

Course Objectives:

Develop ability to:

1. Design combinational and simple sequential circuits using FPGAs.
2. Design various logic circuits employing Cadence / Mentor Graphics / Synopsys /Equivalent CAD tools
3. Design Layout of any combinational circuit (complex CMOS logic gate)
4. Design Inverter characteristics using PSpice simulation model

Course Outcomes:

After completion of course the student would be able to:

CO 1. Design combinational and simple sequential circuits using FPGAs.
CO 2. Design various logic circuits employing Cadence / Mentor Graphics / Synopsys /Equivalent CAD tools
CO 3. Design Layout of any combinational circuit (complex CMOS logic gate)
CO 4. Design Inverter characteristics using PSpice simulation model

Part A : HDL programs: (software to be used is XILINX)

The design shall include Verilog HDL/VHDL design, Logic synthesis, Simulation and verification.

Programming can be done using any HDL complier. Down load the programs on FPGA/CPLD boards and performance testing may be done using logic analyzer apart from verification by simulation with any of the front end tools.

1. Develop HDL code to realize all the logic gates
2. Design of 2-to-4 decoder
3. Design of 8-to-3 encoder (without and with priority)
4. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer
5. Design of 4 bit binary to gray code converter
6. Design of 4 bit comparator
7. Design of Full adder using 3 modeling styles
8. Design of flip flops: SR, D, JK, T
9. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter

PART B: VLSI programs: (any of the CAD tools - **Cadence / Mentor Graphics / Synopsys /Equivalent** CAD tools can used)

The design shall include Gate-level design, Transistor-level design, and Hierarchical design. Layout design and physical verification, placement & route for complex design, static timing analysis of the following:

1. Design CMOS inverter

2. Design CMOS NOR/ NAND gates
3. Design CMOS XOR and XNOR gates
4. Design 4 to 1 Multiplexer
5. Design Static and Dynamic logic circuit (register cell)
6. Design SR Latch
7. Design Pass transistor
8. Design Layout of any combinational circuit (complex CMOS logic gate).
9. Design Inverter characteristics using Pspice simulation model

Note: Any **SIX** of the above experiments from each part are to be conducted (minimum 12 experiments)

Additional Experiments:

1. Finite State Machine Design using Verilog HDL.
2. VLSI design Layout for one-bit full adder.

16MB32P1 - HUMAN VALUES AND PROFESSIONAL ETHICS

III Year B.Tech II Sem
Prerequisite(s): None

L	T	P/D	C
-	-	3/-	2

Course Objectives: Develop the ability to
1. Learn the importance of human values in holistic personality development.
2. Understand the importance of humane environment
3. Initiate trust on fellow human, support human relations.
4. Improve and grow through human relations
5. Promote growth through peace and humanistic education.

Course Outcomes (COs):
At the end of the course, student would be able to:
CO1: Build on personal value system.
CO2: Focus on co existence.
CO3: Translate "Vishwas" to "Samman"
CO4: Understanding existence as co existence
CO5: Compete in professional ethics.

UNIT – I

Course Introduction- Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education, Self Exploration – what is it? its content and process; 'Natural Acceptance' and Experiential Validation - - as the mechanism for self exploration. Continuous Happiness and Prosperity – A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities – the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT – II

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT – II

Understanding Harmony in the Family and Society- Harmony in Human – Human Relationship: Understanding harmony in the family the basic unit of human interaction understanding values in human- human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti.

Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family.

UNIT – IV

Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT - V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order,
b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems.

Strategy for transition from the present state to Universal Human Order

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b) At the level of society: as mutually enriching institutions and organizations.

TEXT BOOKS:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

REFERENCE BOOKS:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.