GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
(Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NAAC with 'A' Grade)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana - 501 301

ACADEMIC REGULATIONS,

PROGRAM STRUCTURE

AND

DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

For CBCS BASED B.TECH – FOUR YEAR PROGRAM
(Applicable for the batches admitted from AY 2018-19)

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ACADEMIC REGULATIONS 2018

For CBCS Based B.Tech PROGRAMMES

(Effective for the students admitted into FIRST year from the Academic Year **2018-19**)

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

Geethanjali College of Engineering and Technology (GCET) offers **four (**4) Year (**eight** (8) Semesters) **Bachelor of Technology** (B.Tech) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2018-19, 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. 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. B.Tech Programme Structure

3.1 A student after securing admission shall complete the B.Tech programme in a minimum period of **four (4)** academic years (**eight** (8) semesters), and a maximum period of **eight (8)** academic years (**sixteen** (16) semesters) starting from the date of commencement of first year first semester (soon after securing admission), failing which student shall forfeit seat in B.Tech program. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the undergraduate programme and award of the B.Tech degree.

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 **four** (4) academic years (**eight** (8) semesters**)**, with each academic year being divided into two semesters of **20 weeks (minimum of 90 working days)** each. Each semester has - '**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) / Tutorial(T) courses;
- One-half (½) of a credit – for one hour / week / semester for Laboratory / Practical (P) Courses or Drawing Periods (D).
- No Credits for mandatory courses.
- 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 (Eℓ C).

a) Foundation Courses (FnC) are further categorized as: (i) HSMC (Humanities and Social Sciences including Management Courses), (ii) BSC (Basic Science Courses), and (iii) ESC (Engineering Science Courses);
b) Core Courses (CoC) and Elective Courses (Eℓ C) are categorized as PS (Professional Courses), which are further subdivided as – (i) PCC (Professional/ Departmental Core) Courses, (ii) PE (Professional/ Departmental Electives), (iii) OE (Open Electives); (iv) Technical Seminar, (v) Mini project and (vi) Project Work (PW) and (vii) Internship;
c) Mandatory course(s) (MC – Non credit oriented)

S.No	Broad Course Classification	Course Group/Category	Course Description
1	Foundation Courses (FnC)	BSC-Basic Science Courses	Includes Mathematics, Physics and Chemistry courses
2		ESC-Engineering Science Courses	Includes Fundamental Engineering Courses
3		HSMC-Humanities and Social sciences including Management Courses	Includes courses related to humanities, Social Sciences and Management
4	Core Courses (CoC)	PCC-Professional Core Courses	Includes core courses related to parent discipline/department/ branch of Engineering
5	Elective Courses (Eℓ C)	PEC-Professional Elective Courses	Includes elective courses related to parent discipline / related department / branch of Engineering
6		OEC-Open Elective Courses	Elective Courses which include interdisciplinary courses or courses in an area outside the parent discipline/department /branch of engineering
7	Core Courses	Project Work	B.Tech Project
8		Internship/Mini-Project/ Technical Seminar	Internship/Mini- Project/Technical Seminar

4. Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned to a group of 20 students, who shall advise him about the B.Tech programme, its structure along with curriculum, choice / option for course(s), based on his competence, progress, pre-requisites and interest.

4.2 A Student may be permitted to Register for Course(s) of his CHOICE with a typical total of 20 Credits per Semester (Minimum being 16 C and Maximum being 24 C, permitted deviation being ± 20%), based on his PROGRESS and SGPA/ CGPA, and study of the 'PRE-REQUISITES' as indicated for various Course(s), in the Department Course Structure and Syllabus contents. However, a MINIMUM of 16 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

4.3 A student must register for all the course(s) in a semester as specified in the program structure, before registering for any extra course(s), from the program structure, subject to **a maximum of four** (4) **more credits** with the approval of the faculty advisor.

4.4 If any theory course(s) has an associated laboratory / practical course, while registering for such course(s), the student shall register for laboratory / practical course(s) along with the corresponding theory course(s) in the same semester**.**

4.5 Student's choice for 'extra course(s)' to reach the Maximum Permissible Limit of 24 Credits (above the typical 20 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor**.**

4.6 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'.

4.7 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 Head of the Department concerned (a copy of the same being retained with Head of the Department, Faculty Advisor and the student).

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

4.9 Course(s) options exercised by the student and approved by Faculty Advisor are final and CANNOT be changed, or inter-changed. Further, alternate choices shall also not be considered. However, if the course(s) that has (have) 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 new course(s) (subject to offering of such course(s)), or for another existing course(s) 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.

4.10 Dropping of course(s) may be permitted, only after obtaining prior approval from the faculty advisor / counselor 'within a period of 15 days' from the beginning of the current semester.

4.11 Open electives: The students have to choose open electives from the list of open electives given. However, the student cannot opt for an open elective course(s) offered by his own (parent) department.

4.12 Professional electives: The students have to choose the required professional electives from the list given.

5. Courses to be offered

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

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

5.3 More than one Instructor may offer the same course(s) (laboratory / practical may be included with the corresponding theory course(s) in the same semester) in any semester. However, selection of choice for students shall be based on - 'first come first serve basis and CGPA criterion'.

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

5.5 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'.

6 Attendance Requirements

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% attendance in aggregate of all the courses (excluding attendance in mandatory course(s) such as Environmental Science, Constitution of India, Intellectual Property Rights, Professional Ethics and Gender Sensitization lab) registered for in that semester.

6.2 A student shall acquire a minimum of 75% attendance in each mandatory course. If he fails to acquire a minimum of 75% attendance in mandatory course(s), such student is deemed to have failed in that mandatory course(s) and shall re-register for such course(s) as and when offered next. Condonation of attendance is not allowed in mandatory course(s).

6.3 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.

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

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

6.6 Students, whose shortage of attendance is not condoned in any semester, are not eligible to take their Semester End Examinations. 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 course(s) 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 course(s), namely, professional elective(s) 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.

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

7 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in section 6.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 35% marks (e.g. 25 out of 70 marks in theory/laboratory/practical/drawing course(s)) 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(s).

7.2 Academic requirements in respect of Internship, Mini-Project, Technical Seminar, Project and mandatory non-credit course(s) are as follows:

7.2.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Internship, if the student secures not less than 40% of the total marks allocated for the course. The student is deemed to have failed, if he does not submit a report on his Internship or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Internship evaluation.

7.2.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Mini Project, if the student secures not less than 40% of the total marks allocated for the course(s). The student is deemed to have failed, if he does not submit a report on his Mini Project or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Mini Project evaluation.

7.2.3 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Technical Seminar, if the student secures not less than 40% of the total marks allocated for the course(s). The student is deemed to have failed, if he does not submit a report on his Technical Seminar or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Technical Seminar evaluation.

7.2.4 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Project, if the student secures not less than 40% of the total marks allocated for the course(s). The student is deemed to have failed, if he does not submit a report on his Project or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule or secures less than 40% of marks in Project evaluation.

Note: He may reappear once for each of the above evaluations (mentioned in 7.2.1 to 7.2.4), 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.

7.2.4.1 For mandatory / non-credit course(s), a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the course(s) in addition to satisfying the attendance requirements mentioned in section 6.2.

7.2.4.2 No marks / letter grades shall be allotted for mandatory/non-credit course(s). Only Pass / Fail shall be indicated in Grade Card.

7.2.4.3 If a student fails in mandatory / non-credit course(s), he shall re-register for that course(s) as and when offered next.

7.3 **Promotion Rules**

S. No.	Promotion	Conditions to be fulfilled
1	First year First semester to First year Second semester	Regular course of study of First year First semester.
2	First year Second semester to Second year First semester	(i) Regular course of study of First year Second semester. (ii) Must have secured at least 50% (20 out of 40 credits) of the credits specified in the program structure of first year (up to and including first year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not (even if the student registers for less than 40 credits, student must still secure a minimum of 20 credits).
3.	Second year First semester to Second year Second semester	Regular course of study of Second year First semester.
4	Second year Second semester to Third year First semester	(i) Regular course of study of Second year Second semester. (ii) Must have secured at least 60% (48 out of 80 credits) of the credits specified in the program structure of second year (up to and including second year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not (even if the student registers for less than 80 credits, student must still secure a minimum of 48 credits).
5	Third year first semester to Third year second semester	Regular course of study of Third year First semester.
6	Third year second semester to Fourth year first semester	(i) Regular course of study of Third year Second semester. (ii) Must have secured at least 60% (72 out of 120 credits) of the credits specified in the program structure of third year (up to and including third year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not (even if the student registers for less than 120 credits, student must still secure a minimum of 72 credits).
7	Fourth year First semester to Fourth year Second semester	Regular course of study of Fourth year First semester.

7.4 A Student shall register for all course(s) covering 160 credits as specified and listed in the Programme Structure, fulfills the Attendance and Academic requirements for 160 Credits securing a minimum of C Grade (Pass Grade) or above in each course(s), and 'earns ALL 160 Credits securing an SGPA ≥ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) ≥ 5.0, in addition to fulfilling the academic requirements of mandatory course(s)s, to successfully complete the B.Tech Programme. The performance of the student in these 160 credits shall be taken into account for the calculation of 'the final CGPA (at the end of undergraduate programme), and shall be indicated in the grade card of IV year II semester.

7.5 Students who fail to earn 160 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.

7.6 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.

7.7 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.

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

8 Evaluation - Distribution and Weightage of Marks

8.1 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 course(s), namely, theory, drawing, practicals, Technical seminar, Project, Mini-Project, Internship etc. and their evaluation is as follows:

8.1.1 Theory, practical, drawing and Project course(s) shall be evaluated based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination),

8.1.2 Internship/Technical seminar shall be evaluated based on 100% CIE (Continuous Internal Evaluation)

8.1.3 Mini-project shall be evaluated based on 100% SEE (Semester End Examination)

Note: A letter grade corresponding to the % marks obtained shall be given for all course(s) as mentioned in section 9.2.

8.2 For theory course(s), 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 FIFTEEN (15) marks, with duration of 120 minutes (20 minutes for objective and 100 minutes for subjective papers). Further, there shall be an allocation of five (5) marks for assignment. The objective paper is set with multiple choice questions, and / or True / False, and /or fill-in the blanks, and / or matching type questions. Subjective paper shall contain 3 questions, one from each unit or part thereof, with internal choice, each for 5 marks. All three questions are to be answered.

8.2.1 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.

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

8.2.3 The first mid-term examination marks and average of the marks of the first set of assignment shall make one set of CIE marks, and the second mid-term examination marks and the average of the marks of the second set of assignment 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(s).

8.2.4 The details of the question paper pattern for Semester End Examination (SEE) 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: Part A shall consist of ten questions, two from each unit of the prescribed syllabus of the course(s). Each question carries 2 marks. All questions are compulsory.
- Part – B: Part B shall consist of five questions, one each from the five units of the prescribed syllabus of the course(s). 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 shall answer either of the questions). The student shall answer all the questions of Part B.

8.2.5 **Absence in mid-term examination(s):**

- If any student is absent in one mid-term examination for any course(s) on any valid reasons certified by the Head of the Department concerned, one written test shall be conducted on all units by the college in each course(s) at the end of the semester.
- If any student is absent in both mid-term examinations for any course(s) on any valid reasons certified by the Head of the Department concerned, only one written test for 25 marks shall be conducted on all units by the college in each course at the end of the semester, and the marks secured out of 25 shall be divided by two, shall be awarded against the said mid-term examination(s).
- A prescribed fee shall be payable by the student for appearing in the above mentioned written test.

8.2.6 For laboratory / practicals / drawing course(s), there shall be a Continuous Internal Evaluation (CIE) during the semester for 30 marks, and 70 marks are assigned for laboratory / practical Semester End Examination (SEE). Out of the 30 marks for CIE, day-to-day work in the laboratory / practical shall be evaluated for 15 marks; and for the remaining 15 marks - two internal practical tests (each of 15 marks) shall be conducted by the concerned laboratory instructor, one at the end of 8 weeks and the other in the last week of the semester. 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/practical internal examinations:

- If any student is absent in one laboratory internal examination for any laboratory course for any valid reasons certified by the Head of the Department concerned, one test shall be conducted for 15 marks covering 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 for any valid reasons certified by the Head of the Department concerned, only one test shall be

conducted covering all experiments and the marks secured out of 15 marks shall be divided by two, which shall be awarded against the said lab internal examinations.

8.2.7 For the course having design and / or drawing (such as Engineering Graphics), the distribution shall be 30 marks for CIE (15 marks for day-to-day work, and 15 marks for internal tests) and 70 marks for SEE (question paper pattern shall be same as for theory examinations). There shall be two internal examinations in a semester and the average of the two shall be considered for the award of marks for internal examinations.

8.2.7.1 If any student is absent in the internal examination in design and / or drawing (such as Engineering Graphics) for any valid reasons certified by the Head of the Department concerned, one internal examination shall be conducted for 15 marks on all experiments of that laboratory / practical course(s), by the college at the end of the semester.

8.2.8 **Internship, Mini-Project, Technical Seminar and Project**

8.2.8.1 There shall be an internship, which the student shall carryout immediately after Second year second semester examinations and pursue it during summer vacation for a duration of four weeks. Internship carried out 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 allocated for the internship, and two Professors / Assoc-Professors of the department. There shall be only CIE for 100 marks for internship and shall be evaluated during third year first semester. There shall be no SEE for Internship.

8.2.8.2 There shall be a Mini Project, which the student shall carryout immediately after Third year second semester examinations and pursue it during summer vacation. Mini Project shall be submitted in a report form, duly approved by the departmental internal evaluation committee, and presented before the examination committee in Fourth year first semester. It shall be evaluated for 100 marks as SEE. The examination committee consists of an external examiner, Head of the Department, supervisor of the mini project and a senior faculty member of the department. There shall be no internal marks (CIE) for Mini Project.

8.2.8.3 There shall be a technical seminar presentation in Fourth year second semester, for which, the student shall collect the information on a specialized topic, prepare a technical report, submit it and present the same before a departmental committee. It shall be evaluated by the departmental committee, consisting of Head of the Department, seminar supervisor and a senior professor. The technical seminar report shall be evaluated for 100 marks as CIE. There shall be no SEE for the technical seminar.

8.2.8.4 There shall be a project, which the student shall carryout in final year second semester. There shall be three reviews, one at the end of the fourth week, another at the end of the ninth week and third at the end of the fourteenth week. The reviews shall be conducted and evaluated by an internal project review committee. The committee shall consist of Head of the Department, the supervisor allocated for the project, and two Professors /Assoc-Professors of the department. Each review shall be evaluated for thirty (30) marks and average of all three reviews shall constitute CIE of thirty (30) marks. Project carried out shall be submitted in a dissertation form, and a presentation of the same shall be made before a final examination committee consisting of Head of the Department, the supervisor and an external examiner, appointed by the chief superintendent of examinations, selected from a panel of examiners suggested by the chairperson, BoS, which evaluates it for seventy (70) marks.

9 Grading procedure

9.1 Grades shall be awarded to indicate the performance of students in each theory course, laboratory / practicals / Engineering Graphics / Drawing, Technical Seminar, Internship, Mini-Project, Project. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in section 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater 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

9.3 A student who has obtained an '**F**' grade in any course(s) shall be deemed to have '**failed**' and is required to reappear as a 'supplementary candidate' in the semester end examination, as and when conducted. However, the internal marks secured earlier in those course(s) shall remain the same.

9.4 A student, who has not appeared for an examination in any course(s), shall be awarded '**Ab**' grade in that course(s), and shall be deemed to have '**failed**' in that course(s). Such a student shall be required to reappear as a 'supplementary candidate' in the semester end examination, as and when conducted. However, the internal marks secured earlier in those course(s) shall remain the same.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns a grade point (GP) in each course, on the basis of the letter grade secured in that course. The corresponding 'credit points (CP)' for a course are computed by multiplying the grade point with credits for that particular course.

Credit points (CP) = grade point (GP) x credits …. For a course

9.7 A student passes a course, only when the student secures a **GP ≥ 5 ('C' grade or above)** in that course.

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all course(s) registered for in a semester, by the total number of credits registered for in 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 course(s) in a semester), 'N' is the number of courses '**registered'** for in that semester (as specifically required and listed under the program structure of the parent department), C is the number of credits allotted to the i^{th} course, and G represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} course.

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the cumulative performance of a student in all the courses registered from all the semesters. The CGPA is the ratio of the total credit points secured by a student in **all the** registered courses in **all** the semesters, and the total number of credits registered for in **all** the semesters. CGPA is rounded off to **two decimal places**. CGPA is thus computed from the First year second semester onwards at the end of each semester as per the formula

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

where '**M'** is the **total** number of courses (as specifically required and listed under the program structure of the parent department) the student has '**registered'** for i.e. from the first semester onwards up to and inclusive of the eighth semester, 'j' is the course indicator index (takes into account, all course(s) from first semester to eighth semester), C is the number of credits allotted to the j^{th} course, and G represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} course. After registration and completion of First year first semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course	Credits	Letter Grade	Grade Point	Credit Points
Course1	4	A	8	4 x 8=32
Course 2	4	O	10	4 x 10=40
Course 3	4	C	5	4 x 5=20
Course 4	3	B	6	3 x 6=18
Course 5	3	A+	9	3 x 9=27
Course 6	3	C	5	3 x 5=15
Total	**21**	**Total Credit Points**		**152**

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point	Credit Points(CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
Total Credits		**69**	**Total Credit Points**		518

CGPA = 518/69 = 7.51

The above illustrated calculation process of CGPA shall be followed for each subsequent semester until eighth semester. The CGPA obtained at the end of eighth semester will become the final CGPA secured for entire B.Tech Programme.

9.10 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs shall be used.

9.11 SGPA and CGPA of a semester shall be mentioned in the semester Memorandum of Grades if all courses of that semester are passed in the first attempt. Otherwise, the SGPA and CGPA shall be mentioned only on the Memorandum of Grades generated after the student has passed his last examination in that semester. However, mandatory course(s) will not be taken into consideration.

10. Passing Standards:

10.1 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(s) in each semester (during the entire B.Tech Programme) for award of the degree.

10.2 After the completion of each semester, a Grade Card or Grade Sheet (Memorandum of Grades) 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 course(s) registered (course(s) code, title, number 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 9.6 through 9.9.

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

% of Marks = (final CGPA – 0.5) x 10

12. Award of Degree

12.1 A student who registers for all the specified course(s) 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 160 credits (with CGPA ≥ 5.0), within eight (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 7.4:

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 courses in 'FIRST APPEARANCE' within the first four (4) academic years (or eight (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 eight (8) sequential semesters, starting from the FIRST year FIRST 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 / silver / bronze medal'.

13. 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. Transitory Regulations

14.1 **General**

14.1.1 A Student who has discontinued for any reason, or has been detained for want of attendance as specified in section 6 or NOT promoted due to lack of required credits as specified in section 7, 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 14.2 through 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 FIRST year of R13/R15 Regulations of JNTUH due to lack of attendance, shall be permitted to join FIRST year FIRST Semester of AR18 Regulations of GCET and 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 FIRST Year. The AR18 Academic Regulations of GCET are applicable to the student from the year and semester of readmission onwards.

14.2.2. A student who has been detained in any semester of SECOND, THIRD and FOURTH years of R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding semester of AR18 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 FIRST Year. The AR18 Academic Regulations of GCET are applicable to the student from the year and semester of readmission onwards.

14.2.3. A student who has been detained in any semester of FIRST, SECOND, THIRD or FOURTH years of AR16 regulations of GCET for want of attendance shall be permitted to join the corresponding semester of AR18 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 FIRST Year. The AR18 Academic Regulations of GCET are applicable to the student from the year and semester of readmission onwards.

14.3 **For students NOT promoted due to shortage of credits**:

14.3.1. A student of R13/R15 Regulations of JNTUH who has been detained due to lack of credits shall be promoted to the next semester under AR18 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his first admission. For subsequent promotions, the rule specified in section 14.4.4 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 in FIRST year. The AR18 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

14.3.2. A student of AR16 Regulations of GCET who has been detained due to lack of credits shall be promoted to the next semester under AR18 Regulations of GCET only after acquiring the required credits as per AR16 regulations. For subsequent promotions, the rule specified in section 14.4.4 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 in FIRST year. The AR18 Academic Regulations of GCET are applicable to the student from the year of readmission onwards.

14.4. **For all students readmitted under AR18 Regulations of GCET**:

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

14.4.2 If a student readmitted into AR18 Regulations has any course(s) to be studied in the semester of his re-admission or succeeding semesters with about 80% of the syllabus in common with course(s) he has studied under his previous regulations, that particular course(s) shall be substituted for by another course(s) by the college (see also section 14.4.3).

14.4.3 If a student taking readmission as per the provisions of section 14.1.1 had not studied in his previous semesters, any course(s) which is/are prescribed for study under AR18 Regulations (in any of the semester(s) preceding the semester of re-admission), he shall pass all such course(s) to meet the academic requirements of AR18 Regulations. One or more of these course(s) may be offered as substitute course(s), as per section 14.4.2. Other course(s) not offered as substitute course(s) shall constitute **Additional Course(s)**, which the student must pass to meet the academic requirements for the award of the degree. *Method of* e*valuation of additional courses shall be the same as the one detailed in section 8.* The college may conduct remedial classes and internal examinations for the benefit of the student. The Academic Regulations of GCET, AR18, under which a student has been readmitted, shall be applicable to the student from that semester.

14.4.4 **Promotion Rule for students initially admitted into R13/R15 Regulations of JNTUH or AR16 Regulations of GCET and re-admitted into AR18 Regulations of GCET**

- To be eligible for promotion from FIRST year to SECOND year, a student must secure a minimum of 50% of the total credits assigned to all the courses he had studied, including substitute courses but excluding Additional Courses, from all the examinations conducted, whether the student takes the examinations or not.
- To be eligible for promotion from SECOND year to THIRD year and THIRD year to FOURTH year, a student must secure a minimum of 60% of the total credits assigned to all the courses he had studied, including substitute courses but excluding Additional Courses, from all the examinations conducted, whether the student takes the examinations or not.
- For this purpose, if the number of credits secured so arrived at is not an integer, the fractional component shall be ignored if it is less than 0.5; else, it shall be rounded off to the next higher integer (e.g. 50.4 is taken as 50 and 50.5 is taken as 51).

14.4.5 The total number of credits that a student acquires for the award of degree, shall be the sum of all credits secured in all the regulations of his study including AR18 Regulations. Credits earned by the student in additional course(s), shall be considered only for award of B.Tech degree, but shall not be considered for calculating SGPA/CGPA.

15. 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, if failed in any course(s) in his earlier regulations, has to pass equivalent courses as prescribed by JNTUH 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 AR18 regulations of GCET, the student has to study and pass those courses in GCET in spite of the 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. Scope

i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".

ii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.

iv) 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.

v) B.Tech (Regular) program is B.Tech 4 year degree program to which students are admitted to FIRST year

vi) B.Tech LE Scheme refers to the system under which students are admitted to SECOND year of the B.Tech FOUR (4) year degree program.

vii) The terms "mid-term" and "internal" are used interchangeably.

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GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)

(Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NAAC with 'A' Grade)

Cheeryal (V), Keesara (M), Medchal Dist., Telangana - 501 301

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 means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that 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.
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 subject 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.

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ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME) FROM THE AY 2019-20

1. **Eligibility for award of B. Tech. Degree (LES)**

   The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.
2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from SECOND year through FOURTH year B.Tech programme (LES) for the award of B.Tech degree.
3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech
4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech (LES).

5. **Promotion rule**

S. No.	Promotion	Conditions to be fulfilled
1.	Second year first semester to Second year second semester	Regular course of study of Second year first semester.
2.	Second year second semester to Third year first semester	(i) Regular course of study of Second year second semester. (ii) Must have secured at least 60% (24 out of 40 credits) of the credits specified in the program structure of second year (up to and including second year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not (even if the student registers less than 40 credits student must still secure a minimum of 24 credits).
3.	Third year first semester to Third year second semester	Regular course of study of Third year first semester.
4.	Third year second semester to Fourth year first semester	(i) Regular course of study of Third year second semester. (ii) Must have secured at least 60% (48 out of 80 credits) of the credits specified in the program structure of third year (up to and including third year second semester), from all the relevant regular and supplementary examinations, whether the student takes those examinations or not (even if the student registers less than 80 credits student must still secure a minimum of 48 credits).
5.	Fourth year first semester to Fourth year second semester	Regular course of study of Fourth year first semester.

6. All the other regulations as applicable to B. Tech. FOUR (4) - year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

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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 means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that 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.
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.

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Vision of the Institution

Geethanjali visualizes dissemination of knowledge and skills to students, who would eventually contribute to well being of the people of the nation and global community.

Mission of the Institution

i. To impart adequate fundamental knowledge in all basic sciences and engineering, technical and Inter-personal skills to students.
ii. To bring out creativity in students that would promote innovation, research and entrepreneurship.
iii. To preserve and promote cultural heritage, humanistic and spiritual values promoting peace and harmony in society.

Vision of the Department

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 of the Department

i. To impart quality education in fundamentals of basic sciences, mathematics, electronics and communication engineering through innovative teaching-learning processes.
ii. To facilitate Graduates define, design, and solve engineering problems in the field of Electronics and Communication Engineering using various Electronic Design Automation (EDA) tools.
iii. 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.
iv. 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)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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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.

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B.Tech. ELECTRONICS AND COMMUNICATION ENGINEERING
AR 18 STRUCTURE FOR UNDERGRADUATE PROGRAM

S.No	Category/ Semester	Credits as per AR18	Credits as per AICTE Model Curriculum
1.	**Humanities and Social Sciences including Management**	**11.5**	**12**
2.	**Basic Sciences**	**24**	**25**
3.	**Engineering Sciences** including workshop, drawing, basics of electrical/mechanical/computer etc.	**26.5**	**24**
4.	**Program Core Courses**	**56**	**48**
5.	**Program Elective Courses:** Subjects relevant to chosen specialization/branch	**18**	**18**
6.	**Open Elective Subjects**: Electives from other technical and/or emerging subjects	**9**	**18**
7.	**Project work, seminar and internship** in industry or elsewhere	**15**	**15**
8.	**Mandatory Courses**: [Induction Program, Environmental Science, Indian Constitution, Professional Ethics]	**4-Slots**	**-**
	Total	**160**	**160**

Course code and definition

S.No.	Category Abbreviation	Description
1.	PCC	Program Core Courses
2.	PEC	Program Elective Courses
3.	PROJ	Project , Internship, Mini Project and Technical Seminar
4.	BSC	Basic Science Courses
5.	ESC	General Engineering Courses
6.	HSMC	Humanities and Social Sciences including Management Courses
7.	OEC	Open Elective Courses
8.	MC	Mandatory Courses

Definition of credit

S. No.	Abbreviation	Credits	Description
1.	L	1	1 Hr. Lecture (L) per week
2.	T	1	1 Hr. Tutorial (T) per week
3.	P	0.5 1	1 Hr. Practical (P) per week 2 Hours Practical(Lab)/week

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ELECTRONICS AND COMMUNICATION ENGINEERING

FIRST YEAR I – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18EN1101	English	HSMC	3	-	-	30	70	100	3
2	18PH1102	Applied Physics	BSC	3	-	-	30	70	100	3
3	18MA1101	Mathematics –I	BSC	3	1	-	30	70	100	4
4	18CH1101	Engineering Chemistry	BSC	3	1	-	30	70	100	4
5	18CS1101	Programming for Problem Solving	ESC	2	-	-	30	70	100	2
6	18EN11L1	English Language and Communication Skills Lab	HSMC	-	-	3	30	70	100	1.5
7	18CH11L1	Engineering Chemistry Lab	BSC	-	-	3	30	70	100	1.5
8	18CS11L1	Programming for Problem Solving Lab	ESC	-	-	2	30	70	100	1
9		Induction Program	MC	-	-	-	-	-	-	-
Total				**14**	**2**	**8**	**240**	**560**	**800**	**20**
Total Periods Per Week				**24**						

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FIRST YEAR II – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18PH1201	Semiconductor Devices	BSC	3	-	-	30	70	100	3
2	18MA1201	Mathematics –II	BSC	3	1	-	30	70	100	4
3	18CS1201	Data Structures	ESC	2	-	-	30	70	100	2
4	18EE1201	Basic Electrical Engineering	ESC	3	-	-	30	70	100	3
5	18ME1202	Engineering Graphics	ESC	1	-	4	30	70	100	3
6	18PH12L1	Semiconductor Devices Lab	BSC	-	-	3	30	70	100	1.5
7	18CS12L1	Data Structures Lab	ESC	-	-	2	30	70	100	1
8	18EE12L1	Basic Electrical Engineering Lab	ESC	-	-	2	30	70	100	1
9	18ME12L1	Engineering Workshop	ESC	-	-	3	30	70	100	1.5
Total				**12**	**1**	**14**	**270**	**630**	**900**	**20**
Total Periods Per Week				**27**						

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SECOND YEAR I – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18MA2101	Complex Variables	BSC	3			30	70	100	3
2	18EC2101	Signals and Systems	PCC	3			30	70	100	3
3	18EC2102	Digital Design	PCC	3			30	70	100	3
4	18EC2103	Circuit Theory	PCC	3	1		30	70	100	4
5	18EC2104	Electronic Circuit Analysis and Design	PCC	3	1		30	70	100	4
6	18EC21L1	Digital Design Lab	PCC			2	30	70	100	1
7	18EC21L2	Electronic Circuit Analysis and Design Lab	PCC			2	30	70	100	1
8	18EC21L3	Signals and Systems Lab	PCC			2	30	70	100	1
9	18CH2101	Environmental Science	MC	3			-	-	-	-
Total				**18**	**2**	**6**	**240**	**560**	**800**	**20**
Total Periods Per Week				**26**						

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SECOND YEAR II – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18MB2201	Management Fundamentals	HSMC	3	-	-	30	70	100	3
2	18EC2201	Analog and Digital Communications	PCC	3	-	-	30	70	100	3
3	18EC2202	Probability Theory and Stochastic Processes	ESC	3	1	-	30	70	100	4
4	18EC2203	Linear Integrated Circuits	PCC	3	-	-	30	70	100	3
5	18EC2204	Electromagnetic Theory and Transmission lines	PCC	3	1	-	30	70	100	4
6	18EC22L1	Analog Communications Lab	PCC	-	-	2	30	70	100	1
7	18EC22L2	Linear Integrated Circuits Lab	PCC	-	-	2	30	70	100	1
8	18EC22L3	Simulation Lab	PCC	-	-	2	30	70	100	1
9	18MC2201	Indian Constitution	MC	3	-	-	-	-	-	-
Total				**18**	**2**	**6**	**240**	**560**	**800**	**20**
Total Periods Per Week				**26**						

Note: Students have to undergo internship program during the summer vacation which shall be evaluated internally during third year first semester. There is no Semester End Examination for this internship.

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THIRD YEAR I – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18CS3101	Operating Systems	PCC	3	-	-	30	70	100	3
2	18EC3101	Microprocessors and Microcontrollers	PCC	3	-	-	30	70	100	3
3	18EC3102	Antennas and Wave Propagation	PCC	3	-	-	30	70	100	3
4	18EC3103	Control Systems Engineering	ESC	3	-	-	30	70	100	3
5	**Professional Elective - I**		PEC	3	-	-	30	70	100	3
	18EC3104	Principles of Information Theory								
	18EC3105	Computer Organization								
	18EC3106	Electronic Measurements and Instrumentation								
	18CS3109	Scripting Languages								
6	18EN31L1	Advanced English Communication Skills Lab	HSMC		-	2	30	70	100	1
7	18EC31L1	Microprocessors and Microcontrollers Lab	PCC		-	2	30	70	100	1
8	18EC31L2	Digital Communications Lab	PCC		-	2	30	70	100	1
9	18EC3107	Internship	PROJ-I		-	-	100	---	100	2
10	18MB3103	Professional Ethics	MC	3	-	-				
Total				**18**	**0**	**6**	**340**	**560**	**900**	**20**
Total Periods Per Week				**24**						

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THIRD YEAR II – SEMESTER

S. No	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18CS3211	Computer Networks	ESC	3	1		30	70	100	4
2	18EC3201	Digital Signal Processing	PCC	3	1		30	70	100	4
Professional Elective – II										
3	18EC3202	VLSI Design	PEC	3			30	70	100	3
	18EC3203	Cellular and Mobile Communications								
	18EC3204	Electronic Sensors								
	18CS3212	Advanced Computer Architecture								
Professional Elective – III										
4	18EC3205	Satellite Communications	PEC	3			30	70	100	3
	18EC3206	Digital Signal Processors and Architectures								
	18EC3207	Digital Design through Verilog HDL								
	18CS3207	Neural Networks								
Open Elective-I										
5	18CE3221	Global Warming and Climate Change	OEC	3			30	70	100	3
	18EE3222	Industrial Safety and Hazards								
	18ME3223	Nano Materials and Technology								
	18CS3225	JAVA Programming								
	18MB3226	Intellectual Property Rights								
6	18CS32L3	Computer Networks Lab	ESC			2	30	70	100	1
7	18EC32L1	Digital Signal Processing Lab	PCC			2	30	70	100	1
8	18EC32L2	Project oriented Lab	PCC			2	30	70	100	1
Total				**15**	**2**	**6**	**240**	**560**	**800**	**20**
Total Periods Per Week				**23**						

Note: Students have to undertake a mini-project during the summer vacation which shall be evaluated as SEE during forth year first semester. There is no internal evaluation.

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FOURTH YEAR I – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18EC4101	Embedded Systems Design	PCC	3			30	70	100	3
2	18EC4102	Microwave Engineering	PCC	3			30	70	100	3
Professional Elective - IV										
3	18EC4103	Optical Communications	PEC	3			30	70	100	3
	18EC4104	Adaptive Signal Processing								
	18EC4105	ASIC Design								
	18CS4102	Machine Learning								
Professional Elective – V										
4	18EC4106	Radar Systems	PEC	3			30	70	100	3
	18EC4107	Speech and Audio Processing								
	18EC4108	Mixed Signal Circuit Design								
	18CS4103	Internet of Things								
Open Elective - II										
5	18CE4131	Building Technology	OEC	3			30	70	100	3
	18EE4132	Energy Conservation and Management								
	18ME4133	Digital Fabrication								
	18CS4135	Knowledge Management								
	18MB4136	Supply Chain Management								
6	18EC41L1	Embedded Systems Lab	PCC			2	30	70	100	1
7	18EC41L2	Microwave Engineering Lab	PCC			2	30	70	100	1
8	18EC41L3	EDA Tools Lab	PCC			2	30	70	100	1
9	18EC4109	Mini Project	PROJ-M					100	100	2
Total				**15**	**0**	**6**	**240**	**660**	**900**	**20**
Total Periods Per Week				**21**						

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FOURTH YEAR II – SEMESTER

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	18MB4202	Engineering Economics and Accounting	HSMC	3			30	70	100	3
Open Elective - III										
2	18CE4241	Disaster Management	OEC	3			30	70	100	3
	18EE4242	Micro-electro-mechanical Systems								
	18ME4243	Principles of Automobile Engineering								
	18CS4245	Database Systems								
	18MB4246	Entrepreneurship								
Professional Elective - VI										
3	18EC4201	Global Positioning System	PEC	3			30	70	100	3
	18EC4202	Digital Image and Video Processing								
	18EC4203	Low Power VLSI								
	18CS4207	Data Analytics								
4	18EC4204	Technical Seminar	PROJ-TS			2	100	-	100	1
5	18EC4205	Project	PROJ			20	30	70	100	10
Total				**9**	**0**	**22**	**220**	**280**	**500**	**20**
Total Periods Per Week				**31**						

OPEN ELECTIVES

OPEN ELECTIVES offered by a department SHOULD NOT be taken by the students of the same department.

OPEN ELECTIVE – I		
S. No.	**Name of the Course**	**Course Code**
21	Global Warming and Climate Change (CE)	18CE2221/18CE3121/18CE3221
22	Industrial Safety and Hazards (EEE)	18EE2222/18EE3122/18EE3222
23	Nano Materials and Technology (ME)	18ME2223/18ME3123/18ME3223
24	Electronic Measuring Instruments (ECE)	18EC2224/18EC3124/18EC3224
25	JAVA Programming (CSE)	18CS2225/18CS3125/18CS3225
26	Intellectual Property Rights (MBA)	18MB2226/18MB3126/18MB3226

OPEN ELECTIVE – II		
S. No.	**Name of the Course**	**Course Code**
31	Building Technology (CE)	18CE3231/18CE4131
32	Energy Conservation and Management (EEE)	18EE3232/18EE4132
33	Digital Fabrication (ME)	18ME3233/18ME4133
34	Principles of Communication Systems (ECE)	18EC3234/18EC4134
35	Knowledge Management (CSE)	18CS3235/18CS4135
36	Supply Chain Management (MBA)	18MB3236/18MB4136

OPEN ELECTIVE - III		
S. No.	**Name of the Course**	**Course Code**
41	Disaster Management (CE)	18CE4241
42	Micro-electro-mechanical Systems (EEE)	18EE4242
43	Principles of Automobile Engineering (ME)	18ME4243
44	Biomedical Instrumentation (ECE)	18EC4244
45	Database Systems (CSE)	18CS4245
46	Entrepreneurship (MBA))	18MB4246

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18EN1101- English

B.Tech. ECE - I Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None.

Course Objectives: Develop ability to

1. Improve the language proficiency in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Equip themselves to study the academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
3. Develop Study Skills and Communication Skills in formal and informal situations.
4. Speak proficiently and listen effectively.

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

CO1. Infer /use the vocabulary appropriately in any situation
CO2. Construct meaningful and explicit sentences in written form.
CO3. Acquire basic proficiency in English including reading comprehension and writing skills.
CO4. Communicate confidently in various contexts and different cultures
CO5. Comprehend the given text and respond appropriately.
CO6. Speak proficiently and listen effectively.

UNIT-I: The Raman Effect' from the prescribed text book 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation - The use of Prefixes and Suffixes, One-word Substitutes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures - Use of Phrases and Clause in Sentences- Importance of Proper Punctuation - Techniques for writing precisely–Paragraph writing– Types, Structures and Features of a Paragraph-Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT-II: 'Ancient Architecture in India' from the prescribed text book 'English for Engineers' Published by Cambridge University Press.

Vocabulary Building: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-Pronoun Agreement and Subject - Verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension.

Writing: Format of a Formal Letter- Writing Formal Letters, Letter of Complaint, Letter of Requisition, Job Application with Resume.

UNIT-III: 'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading-Skimming and Scanning.

Writing: Nature and Style of Sensible Writing -Abstract writing..

UNIT-IV: 'What Should You Be Eating' from the prescribed text book 'English for Engineers' Published by Cambridge University Press.

Vocabulary Building: Standard Abbreviations in English.

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension-Intensive Reading and Extensive Reading.

Writing: Writing Practices—Writing- Introduction and Conclusion, Blog-Writing and Responding to a Blog, Essay Writing, Précis Writing.

UNIT-V: How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: Technical Vocabulary and their usage.

Grammar: Active and Passive voice.

Reading: Reading Comprehension-Exercises for Practice.

Writing: Technical Reports-Introduction–Characteristics of Report– Categories of Reports- Formats-Structure of Reports (Manuscript Format)-Types of Reports- Writing a Report.

TEXT BOOK(S):

1. English for Engineers, Sudarshana, N.P.and Savitha, C. Cambridge University Press.

REFERENCE BOOKS:

1. Practical English Usage, Swan, M. Oxford University Press.
2. Communication Skills, Kumar, S and Lata, P. Oxford University Press.
3. Remedial English Grammar, Wood, F.T. Macmillan.
4. On Writing Well Zinsser, William Harper, Resource Book.
5. Study Writing, Hamp-Lyons, Cambridge University Press.
6. Exercises in Spoken English. Parts I–III. CIEFL, Hyderabad, Oxford University.

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18PH1102 - Applied Physics

B.Tech. ECE - I Year, I Sem.

L	T	P	C
3	-	-	3

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the concept of matter waves and application of Schrodinger wave equation.
2. Discuss the formation of energy bands in solids, classification of solids.
3. Understand the concept of Fermi level in intrinsic and extrinsic semiconductors and Hall Effect
4. Understand the concepts of light amplification, working of various types of lasers, optical fibers and their applications.
5. Understand different types of dielectric polarization mechanisms and classification of magnetic materials.

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

CO1. Explain fundamental concepts on quantum behavior of matter in its micro state.
CO2. Distinguish conductors, semiconductors and insulators.
CO3. Identify the type of extrinsic semiconductors through Hall Effect.
CO4. Explain phenomena of light amplification process, construction and working of different types of Lasers, Fiber optics and their applications in different fields.
CO5. Explain different types of dielectric polarization mechanisms, properties of different dielectric materials and their applications. Distinguish different types of magnetic materials.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law (qualitative), Photoelectric effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT II: Introduction to theory of solids

Electron in a periodic potential-Bloch theorem, Kronig-Penney 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 and insulators.

UNIT-III: Semiconductors

Classification of semiconductors, n-type, p-type, carrier concentration in Intrinsic and Extrinsic Semiconductors, Fermi level in Intrinsic and Extrinsic Semiconductors, variation of Fermi level with temperature and concentration of dopants in extrinsic semiconductors, direct and indirect band gap semiconductors, Hall effect and its

applications.

UNIT-IV: Lasers and Fiber Optics

Lasers: Interaction of radiation with matter: Absorption, Spontaneous emission and Stimulated emission. Characteristics of Lasers, Resonating cavity, active medium, Pumping methods and mechanisms, population inversion, Construction and working of Lasers: Nd:YAG Laser, He-Ne Laser, Carbon dioxide (CO_2) Laser, Applications of Lasers.

Fiber Optics: Introduction, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index optical fibers, Losses associated with optical fibers, Applications of optical fibers.

UNIT-V: Dielectric and Magnetic Properties of Materials

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, Ferroelectric, Piezoelectric and their applications.

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 and their applications.

TEXT BOOKS:

1. Physics, Halliday, Resnick and Krane, Wiley publishers, 5th edition, 2018.
2. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learing.

REFERENCE BOOKS:

1. Semiconductor Optoelectronics: Physics and Technology, J. Singh, Mc Graw - Hill inc. 1995.
2. A Textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand publications, revised edition.
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL.
4. Introduction to Solid State Physics, C Kittel, Wiley Publications, 8th edition.

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18MA1101 - Mathematics-I

L	T	P/D	C
3	1	-	4

B.Tech. ECE - I Year, I Sem.

Prerequisite(s): None.

Course Objectives: Develop ability to

1. Understand various types of matrices, properties and rank of the 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 and applications in engineering problems namely, Newton's law of cooling, Natural growth and decay.
4. Solve second and higher order differential equations of various types.
5. Analyze properties of Laplace Transform, Inverse Laplace Transform, convolution theorem and their applications to ordinary differential equations.

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

CO1. Write the matrix representation of a set of linear equations and analyse solution of a system of equations.
CO2. Deduce eigenvalues and eigenvectors of a matrix and apply the same to reduce quadratic form into a canonical form through linear and orthogonal transformations
CO3. Identify the type of differential equation and use the appropriate method to solve the same.
CO4. Apply higher order differential equations to solve engineering problems.
CO5. Solve Ordinary differential equations of second and higher order using Laplace Transform techniques.

UNIT-I: Matrices

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method.

UNIT-II: Eigenvalues and Eigenvectors

Linear Transformation and Orthogonal Transformation: Eigenvalues and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: First Order Ordinary Differential Equations

Exact, linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of Natural Growth and Decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-IV: Ordinary Differential Equations of Higher Order

Second and higher order linear differential equations with constant coefficients, Non homogeneous of the type e^{ax}, sin ax, cos ax , x^n, $e^{ax}V(x)$, and $xV(x)$; Method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-V: Laplace Transforms

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. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOKS:

1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications.
2. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill, New Delhi.
3. Engineering Mathematics, Paras Ram, 2nd Edition, CBS Publishers.

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Cheeryal (V), Keesara (M), Medchal Dist., Telangana - 501 301

18CH1101- Engineering Chemistry

B. Tech. ECE - I Year, I Sem.

L	T	P/D	C
3	1	-	4

Prerequisite(s): None.

Course objectives: Develop ability to

1. Bring adaptability to the concepts of chemistry and to impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
2. Solve the problem of hardness and acquire the knowledge of various water treatment methods.
3. Acquire the knowledge of electrochemistry and corrosion which are essential for engineers to understand the problem of corrosion in industry.
4. Impart the knowledge of reaction mechanisms and synthetic aspects useful for understanding reaction pathways.
5. Acquire the knowledge on various spectroscopic techniques and apply them for medical and other fields.

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

CO1. Explain atomic, molecular and electronic changes.
CO2. Explain hardness of water and its treatment methods.
CO3. Explain the principles and concepts of electrochemistry. Understand the problem of corrosion in industry.
CO4. Explain various reaction mechanisms and apply them in synthesis of organic compounds.
CO5. Apply required skills of various spectroscopic techniques in medical and other fields.

UNIT – I: Molecular structure and Theories of Bonding

Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), Molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2 and F_2 molecules. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral and Octahedral geometries. Crystal Field Stabilization Energies (CFSE). Applications of CFT- Magnetic Properties of the Octahedral and Tetrahedral Complexes.

UNIT - II: Water and its treatment

Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water - Reverse osmosis. Numerical problems.

UNIT - III: Electrochemistry and corrosion

Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation , determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

UNIT - IV: Reaction Mechanisms and molecules of industrial importance

Reaction Mechanisms: Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff's and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. **Oxidation reactions**: Oxidation of alcohols using $KMnO_4$ and chromic acid. **Reduction reactions**: reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Polymers: Classification of polymers, Types of Polymerization–addition and condensation, differences between addition and condensation polymers, Mechanism of free radical addition polymerization. Preparation, properties and engineering applications of PVC, Teflon and Nylon- 6, 6.

UNIT - V: Spectroscopic techniques and applications

Principles of spectroscopy, selection rules and applications of electronic spectroscopy. vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

TEXT BOOKS:

1. Text book of Engineering Chemistry by Dr.A.Jayashree, Wiley publication, New-Delhi, 2018.
2. Engineering Chemistry by Dr. Thirumala Chary and Dr. E. Laxminarayana, Scitech publications, 2018.

REFERENCE BOOKS:

1. Selected topics in Inorganic Chemistry by Wahid U. Malik, G.D. Tuli and R.D Madan. S.Chand publications, 17th Edition.
2. Elements of Physical Chemistry, by P.W. Atkins 4th Edition.
3. Fundamentals of Molecular Spectroscopy, by C.N. Ban well, 4th Edition.
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E. Schore, 5th Edition.

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18CS1101- Programming for Problem Solving

B.Tech. ECE - I Year, I Sem.

L	T	P/D	C
2	-	-	2

Pre-requisite(s): None.

Course Objectives: Develop ability to

1. Solve problems by developing algorithms to solve problems using Raptor tool.
2. Understand the concepts of variables, constants, basic data types and input and output statement in a C programming language.
3. Understand the use of sequential, selection and repetition control statements into the algorithms implemented using C programming language.
4. Understand of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
5. Understand the concepts related to arrays, strings and pointers and also with dynamic memory allocation in the context of C programming language.

Course Outcomes: After completion of the course, student 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, basic data types and input and output statement in a C language program.
CO3. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.
CO4. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
CO5. Write C programs using arrays, strings and pointers and also with dynamic memory allocation.

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.

Strings – Concepts, C Strings, String Input / Output functions, string manipulation functions, arrays of strings, string / data conversion, 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 BOOK(S):

1. Computer Science: A Structured Programming Approach Using C, B.A. Forouzan and R.F. Gilberg, 3rd Edition, Thompson Learning, 2007 Reprint.

REFERENCE BOOKS:

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

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18EN11L1- English Language and Communication Skills Lab

L	T	P/D	C
-	-	3	1.5

B.Tech. ECE - I Year, I Sem.

Prerequisite(s): None**.**

Course Objectives: Develop ability to

1. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
2. Sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. Bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
4. Improve the fluency of students in spoken English and neutralize their Mother Tongue Influence.
5. Train students to use language appropriately for public speaking and interviews.

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

CO1. Listen actively, speak fluently and write accurately.
CO2. Speak with clarity and confidence reducing MTI and enhance Employability skills.
CO3. Demonstrate better understanding of nuances of English Language.
CO4. Communicate intelligibly at work place.
CO5. Perform effectively in Interviews.
CO6. Plan and present ideas explicitly.

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

Module-I

CALL Lab: Understand: Listening Skill-Its importance–Purpose-Process-Types-Barriers to Listening.

Practice: Introduction to Phonetics –Speech Sounds –Vowels and Consonants.

ICS Lab: Understand: Communication at Work Place-Spoken vs. Written language. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues Greetings– Taking Leave– making request and seeking permission. Introducing oneself and others.

Module-II

CALL Lab: Understand: Structure of Syllables–Word Stress and Rhythm–Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent-Stress Shift-Weak Forms and Strong forms in context.

ICS Lab: Understand: Features of Good Conversation–Non-verbal Communication.

Practice: Telephone Etiquette.

Descriptions- Places, Objects, Events and Process.

Module-III

CALL Lab: Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI), Examples from different parts of the country.

Practice: Common Indian Variants in Pronunciation–Differences in British and American Pronunciation.

ICS Lab: Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Module-IV

CALL Lab: Understand: Listening for General Details (2 practice exercises).

Practice: Listening Comprehension Tests (2 practice exercises).

ICS Lab:

Understand: Public Speaking-Debate– Exposure to Structured Talks (2 practice exercises).

Practice: Making a Short Speech– Extempore (2 practice exercises).

Module-V

CALL Lab:

Understand: Listening for Specific Details (2 practice exercises).

Practice: Listening Comprehension Tests (2 practice exercises).

ICS Lab: Understand: General Interview Skills. Practice: Mock Interview Skills.

TEXT BOOKS:

1. Speaking English Effectively 2nd Edition by Krishna Mohan & N. P Singh, Mac Millan Publishers, 2011.
2. ELCS Lab Manual by Faculty, Department of English, GCET.

REFERENCE BOOKS:

1. How to Prepare for Interviews by Shashi Kumar. V & Dhamija P. V.
2. English Pronunciation in Use, Hancock. M , Cambridge University Press.
3. English Language Communication Skills Lab Manual Cum Workbook by Cengage Learning India, 2013.
4. Creative Writing Skills by Ashraf Rizvi.

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18CH11L1– Engineering Chemistry Lab

B. Tech. ECE - I Year, I Sem.

L	T	P/D	C
-	-	3	1.5

Prerequisite(s): None.

Course objectives: Develop ability to

1. Estimate the hardness content in water to check its suitability for drinking purpose.
2. Use instrumental methods namely, Potentiometry and Conductometry to find the concentration of a given solution.
3. Measure physical properties like surface tension, adsorption and viscosity.
4. Know the synthesis of most effective drug molecules.
5. Determine the rate constant of reactions from concentrations as a function of time.

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

CO1. Determine parameters like hardness content in water.
CO2. Use instrumental methods like Potentiometry and Conductometry.
CO3. Determine physical properties like surface tension, adsorption, acid value and viscosity.
CO4. Use techniques which are fundamental in the synthesis of Aspirin, Paracetemol etc.
CO5. Estimate rate constant of a reaction from concentration – time relationships.

List of Experiments

I. Titrimetry

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of acid value of coconut oil.

II Instrumental Methods

A. Potentiometry

3. Estimation of HCl by Potentiometric titrations
4. Estimation of Fe^{2+} by Potentiometry using $KMnO_4$

B. Conductometry

5. Estimation of an HCl by Conductometric titrations
6. Estimation of Acetic acid by Conductometric titrations

III. Physical Constants

7. Determination of viscosity of a given liquid by using Ostwald's viscometer.
8. Determination of surface tension of a given liquid using stalagmometer.

IV.Synthesis

9. Synthesis of Aspirin and Paracetemol.

V.Kinetics

10. Determination of rate constant of acid catalysed hydrolysis of methyl acetate

VI.Additional Experiments

11. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of partition coefficient of acetic acid between n-butanol and water.

REFERENCE BOOKS:

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi).
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi).
3. Vogel's text book of practical organic chemistry 5^{th} edition.
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara.

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18CS11L1 - Programming for Problem Solving Lab

B.Tech. ECE - I Year, I Sem.

L	T	P/D	C
0	0	2	1

Pre-requisite(s): None.

Course Outcomes: Develop ability to

1. Solve problems by developing algorithms to solve problems using Raptor tool.
2. Understand the concepts of variables, constants, basic data types and input and output statement in a C programming language.
3. Understand the use of sequential, selection and repetition control statements into the algorithms implemented using C programming language.
4. Understand of structured design by implementing programs with functions and passing of parameters to solve more complex problems.
5. Understand the concepts related to arrays, strings and pointers and also with dynamic memory allocation in the context of C programming language.

Course Outcomes: After completion of the course, student 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, basic data types and input and output statement in a C language program.

CO3. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.

CO4. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.

CO5. Write C programs using arrays, strings and pointers and also with dynamic memory allocation.

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

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

8	Write a C program to find sum of n natural numbers Write a C program to find individual digits of the given number Write a C program to find factorial of a given number
9	Write a C program to display the prime numbers below n (where n value is given by user) 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. Write a C program to generate the first n terms of the sequence. Write a C program to find the quadratic roots of an equations Write a c program to calculate sum of the following geometric equation Sum=$1+x+x^2+x^3+\ldots..+x^n$
10	Write a C program to find the given number is palindrome or not Write a C program to find GCD and LCM of two given numbers using functions Write a C program to find the factorial of a given number using recursive function Write a C program to generate the fibonacci series using recursive function
11	Write a c program to find largest and smallest numbers in a list of array elements using functions Write a C program to sort the given list of elements in ascending order using functions. 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". Using fixed length array Using variable length array.
12	Find the duplicate elements in the list of sorted array Write a C program that uses functions to perform the Addition of Two Matrices Write a C program that uses functions to perform the Multiplication of Two Matrices
13	Write a C program to find weather a given string is palindrome or not. Write a C program to insert characters at a given location in a given string. Write a C program to delete characters from a given string and position Write a C program to print the number of vowels and consonants using Strings.
14	Write a C program to convert Roman number to Decimal Number. Write a C program to find the 2's Compliment of a given string Write a C program to Reverse a String by Passing it to function C Program to Input a String with at least one Number, Print the Square of all the Numbers in a String
15	Write a C program to swap two integers using following methods a) call by value b) call by reference Write a C program to find sum of even and odd numbers using functions and pointers
16	Write a C program to find Largest Number Using Dynamic Memory Allocation. Write a C program to return multiples values from a function using pointers

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18PH1201 - Semiconductor Devices

B.Tech. ECE - I Year, II Sem.

L	T	P	C
3	-	-	3

Pre-requisite(s): 18PH1102-Applied Physics

Course objectives: Develop ability to

1. Analyze p-n junction diode and its characteristics; understand breakdown mechanisms in semiconductor diodes and operation of photo and varactor diodes.
2. Understand the working of optoelectronic materials and devices
3. Understand the functioning of rectifiers and filters; working of Zener diode as a voltage regulating device.
4. Understand the operation of BJT, its various configurations and applications.
5. Discuss various methods of transistor biasing, understand the basic concepts of BJT and JFET.

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

CO1. Explain V-I characteristics of p-n junction diode, photo diode and varactor diode.
CO2. Analyze the working of various optoelectronic devices.
CO3. Explain working of half wave and full wave rectifiers, filters and their applications.
CO4. Explain the functioning of BJT, distinguish various configurations of BJT and their applications.
CO5. Analyze various transistor biasing methods and functioning of FET, summarize the differences between BJT and FET.

UNIT I: p-n junction diode

Qualitative theory of p-n junction, Energy level diagram of p-n junction in forward and reverse bias condition, p-n junction as a diode, volt-ampere characteristics, temperature dependence of V-I characteristic, Transition and Diffusion capacitances (qualitative),breakdown mechanisms in semiconductor diodes, Zener diode characteristics, Photo diode, Varactor diode characteristics.

UNIT II: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT III: 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 IV: Bipolar Junction Transistor

Junction transistor, BJT symbol, transistor construction, BJT operation, common base, common emitter and common collector configurations. Transistor current components, limits of operation, transistor as an amplifier, comparison of CB, CE, CC amplifier configurations.

UNIT V: Transistor biasing-stabilization and Field Effect Transistor

The DC and AC load lines, Operating point, need for biasing , fixed bias, collector feedback bias, Emitter feedback bias, Collector-Emitter feedback bias, Voltage divider bias - bias stability and stabilization factors, stabilization against variations in V_{BE} and β.

Field Effect Transistor: The Junction field effect Transistor (Construction, Principle of operation, symbol) Pinch – off voltage, V-I characteristics, The JFET small signal model, comparison of BJT and FET (Qualitative treatment).

TEXT BOOKS:

1. Electronic Devices & Circuits, Millman's Halkias, Mc Graw Hill Book Publishers, 4th edition, 2017.
2. Engineering Physics, H.K. Malik, A. K. Singh, Tata Mc Graw Hill Book Publishers, 2nd edition, 2017.

REFERENCE BOOKS:

1. Electronic devices & Circuits, S Salivahanan, N Srushkumar, A Vallava Raj, Tata Mc Graw Hill Book Publishers, 2nd edition.
2. Fundamentals of Physics, Halliday Resnick and Krane, John Weily Publishers, 5th edition.
3. Online course: "Optoelectronic materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL.

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18MA1201 - Mathematics-II

B.Tech. ECE - I Year, II Sem.

L	T	P/D	C
3	1	-	4

Prerequisite(s): 18MA1101 - Mathematics - I

Course Objectives: Develop ability to

1. Understand Geometrical approach to the mean value theorems, their application to the mathematical problems and evaluate improper integrals using Beta and Gamma functions.
2. Identify the methods of differential calculus to optimize single and multivariable functions.
3. Evaluate multiple integrals and apply the same to solve engineering problems.
4. Explain properties of vector operators. Use vector calculus to determine the length of a curve, area between the surfaces and volume of solids.
5. Apply partial differential equations to solve problems in one dimensional heat and wave equations.

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

CO1. Apply mean value theorem on mathematical problems, evaluate improper integrals, surface areas and volumes of revolutions of curves.
CO2. Apply the methods of differential calculus to optimize single and multivariable functions.
CO3. Evaluate multiple integrals and apply the concepts of same to find the areas and volumes.
CO4. Apply vector operators on scalar and vector point functions to compute length of a curve, area between the surfaces and volume of solids, using vector calculus.
CO5. Apply partial differential equations to solve problems like one dimensional wave equation and one dimensional heat equation that arise in engineering branches.

UNIT-I: Mean value Theorems and Improper Integrals

Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem and Cauchy's mean value theorem with their Geometrical Interpretation and applications,. Taylor's Series.
Definition of Improper Integral: Beta and Gamma functions and their applications.
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates).

UNIT-II: Multivariable calculus (Partial Differentiation and applications)

Definitions of Limit and continuity: Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-III: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form);

Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

UNIT-IV: Vector Calculus

Vector Differentiation: Vector point functions and Scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

Vector Integration : Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

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. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOKS:

1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications.
2. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill, New Delhi.
3. Engineering Mathematics, Paras Ram, 2nd Edition, CBS Publishers.

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18CS1201 - Data Structures

B.Tech. ECE - I Year, II Sem.

L	T	P/D	C
2	-	-	2

Prerequisite(s): 18CS1101 - Programming for Problem Solving

Course Objectives: Develop ability to

1. Introduce the structure, union, and enumerated types
2. Introduce to linear lists, implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, bubble sort, insertion sort; sequential and binary searching algorithms.
4. Concepts and principles of stacks and queues and their applications.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams. Introduction to Non-linear data structures.

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

CO1. Use the type definition, enumerated types, define and use structures, unions in programs using C language.
CO2. Understand the time and space complexity. Ability to implement linear lists.
CO3. Write programs that sort data using selection, bubble, insertion sort 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. Define basic non-linear list terminologies.

UNIT – I

Enumerated – The Type Definition (typedef), Enumerated types

Structure and Union Types – Declaration, initialization, accessing structures, operations on structures, Complex structures, Structures and functions, passing structures through pointers, self referential structures, unions, bit fields.

Command line arguments, Preprocessor commands.

UNIT – II

Basic concept of order of complexity through the example programs

Linear list - Singly linked list implementation, insertion, deletion and searching operations on linear list

UNIT - III

Sorting - Selection sort, bubble sort, insertion sort techniques (Using Arrays)

Searching - Linear search, binary search techniques (Using Arrays)

UNIT – IV

Stacks – Introduction, Principle, Operations: Push and Pop, In-fix to Post-Fix Conversion and Post-Fix evaluation. (Array implementation.)

Queues - Introduction, Principle, Operations: Enqueue and Dequeue. (Array implementation.)

UNIT – V

File Input and Output – Concept of a file, 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.

Program Development – Multi-source files, Separate Compilation of functions

Basic Non-Linear Data Structures: Introduction, Definition and terminology of Trees, Graphs.

TEXT BOOK(S):

1. B.A. Forouzan and R.F. Gilberg, Computer Science: A Structured Programming Approach Using C, Thompson Learning, 3rd Edition, 2007 Reprint.

REFERENCE BOOKS:

1. Schaum's Outline of Programming with C, Byron Gottfried, McGraw-Hill.
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.
6. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.

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18EE1201 - Basic Electrical Engineering

B.Tech. ECE - I Year, II Sem.

L	T	P	C
3	-	-	3

Pre requisite(s): None

Course Objectives: Develop an ability to

1. Introduce the concepts of electrical circuits and its components
2. Understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. Study and understand the different types of DC/AC machines and Transformers.
4. Import the knowledge of various electrical installations.
5. Introduce the concept of power, power factor and its improvement.

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

CO1. Analyze and solve DC electrical circuits using network laws and theorems.
CO2. Analyze and solve AC electrical circuits using network laws and theorems
CO3. Analyze basic Electric and Magnetic circuits
CO4. Study the working principles of Electrical Machines
CO5. Introduce components of Low Voltage Electrical Installations

UNIT-I: D.C. Circuits

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II: A.C. Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R- L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

UNIT-V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

REFERENCE BOOKS:

1. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

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18ME1201 - Engineering Graphics

B Tech. ECE - I Year, II Sem.

L	T	P/D	C
1	-	4	3

Pre-requisite(s): None.

Course objectives: Develop ability to

1. Understand basic concepts in engineering drawing.
2. Understand the principle of orthographic projection and isometric projection for planes and solids.
3. Draw sectional views and development of surfaces.
4. Draw isometric views and pictorial views of solids.
5. Learn basic concepts and commands in AutoCAD.

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

CO1. Draw various curves and scales in engineering drawing practice.
CO2. Draw orthographic projections of points, lines and planes.
CO3. Draw orthographic projections of solids and sections.
CO4. Draw Isometric Views to Orthographic Views and Vice-versa and development of surfaces of objects.
CO5. Apply basic AutoCAD commands for engineered drawings.

UNIT - I: Introduction to Engineering Drawing:

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain and Diagonal.

UNIT - II: Orthographic Projections:

Principles of Orthographic Projections– Conventions –Projections of Points and Lines, Projections of Plane regular geometric figures.

UNIT - III: Projections :

Projections of Regular Solids, Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone, Sphere.

UNIT - IV: Development of Surfaces of Right Regular Solids:

Prism, Cylinder, Pyramid and Cone.

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

UNIT – V: Conversion of Isometric Views:

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Introduction to CAD: (For Internal Evaluation Weightage only):

Introduction to CAD Software Package Commands. - Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar, 53rd Edition 2016.
2. Engineering Drawing / Basant Agrawal and McAgrawal/ McGrawHill, 2nd Edition 2013.

REFERENCE BOOKS:

1. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford, First Edition 2015.
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson, 2nd Edition 2013
3. Computer Aided Engineering Drawing – K Balaveera Reddy, CBS Publishers. 2nd Edition 2015.

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18PH12L1-Semiconductor Devices Lab

B.Tech. ECE - I Year, II Sem.

L	T	P/D	C
-	-	3	1.5

Pre-requisite(s): 18PH1102-Applied Physics

Course Objectives: Develop ability to

1. Determine magnetic induction at several points on the axis of coil carrying current and the wavelength of LASER.
2. Determine time constant of a RC circuit, energy gap of a given semiconductor, Hall coefficient, work function of a given material and resonant frequency of LCR circuit.
3. Plot V-I characteristics of LED, p-n junction and Zener diode, understand rectification process and working of rectifier, understand the conversion of light into electrical energy.
4. Plot the characteristics of transistor in different configurations.
5. Plot drain and transfer characteristics of a Field Effect Transistor (FET).

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

CO1. Summarize working principle of electromagnetic induction and compute the wavelength of a laser.
CO2. Compute time constant of RC circuit, energy gap of semiconductor, identify type of semiconductor, compute work function of a given material and resonant frequency of LCR circuit.
CO3. Demonstrate the V-I characteristics of LED, p-n junction diode, the application of Zener diode as voltage regulator and conversion of ac to dc with and without filters, exhibits knowledge in developing various applications of solar cells.
CO4. Evaluate current gain of a given n-p-n transistor.
CO5. Analyze the drain and transfer characteristics of FET in common source configuration.

Any ten of the following fourteen experiments are mandatory to perform by each student

1. Draw the V-I characteristics of LED.
2. Determination of the wavelength of a given source of LASER-Diffraction grating.
3. Determination of time constant of a given RC combination.
4. Determination of energy gap of a given semiconductor.
5. V-I Characteristics of p - n junction diode and Zener diode.
6. Input and Output characteristics of n-p-n transistor - CE and CB configurations.
7. Conversion of ac to dc by using half wave rectifier with and without filters.
8. Conversion of ac to dc by using full wave rectifier with and without filters.
9. FET characteristics.
10. V-I characteristics of a Solar cell.
11. Determination of resonant frequency and quality factor of series LCR circuit.
12. Hall Effect: To determine Hall coefficient of a given semiconductor.
13. Photo electric effect: To determine work function of a given material.
14. Stewart-Gee's experiment. Determination of magnetic field along the axis of a current carrying coil.

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18CS12L1 - Data Structures Lab

B.Tech. ECE - I Year, II Sem.

L	T	P/D	C
-	-	2	1

Pre-requisite(s): None.

Course Objectives: Develop ability to

1. Introduce the structure, union, and enumerated types
2. Introduce to linear lists, implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, bubble sort, insertion sort; sequential and binary searching algorithms.
4. Concepts and principles of stacks and queues and their applications.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams. Introduction to Non-linear data structures.

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

CO1. Use the type definition, enumerated types, define and use structures, unions in programs using C language.
CO2. Understand the time and space complexity. Ability to implement linear lists.
CO3. Write programs that sort data using selection, bubble, insertion sort 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. Define basic non-linear list terminologies.

Week No	Name of the program
1	Write a C program to implement complex structures for the following operations. i) Addition of two Complex numbers ii) Multiplication of two Complex Numbers
2	a) Write a C program to implement arrays of structures? b) Write a C program to implement bit fields in C?
3	a) Write a C Program to store the information (name, roll no, and branch) of a student using unions. b) Write a C program to implement inter function communication by passing pointers to a structure.
4	Write a C program to implement singly linked list for the following operations. a) Insertion b)Deletion c)Search
5	a) Write a C program to sort the elements using selection sort b) Write a C program to sort the elements using Bubble sort.
6	a) Write a C program to sort the elements using Insertion sort b) 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".

7	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".
8	Write a C program convert infix to postfix notation and postfix evaluation using stack.
9	Write a C program implement Queue using arrays for the following operations. i) Enqueue ii) Dequeue iii) Peek iv) Display
10	Write a C program open a new file and implement the following I/O functions. i) fprintf(), fscanf() ii) getw(), putw() iii) getc(), putc()
11	a) Write a C program to copy data from one file to another. b) Write a C program to merge two files, using command line arguments.
12	Write a C program to implement multi file programming for basic arithmetic operations

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18EE12L1 - Basic Electrical Engineering Lab

B. Tech. ECE - I Year, II Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s): None.

Course Objectives: Develop ability to

1. Analyze a given network by applying various electrical laws and network theorems
2. Know the response of electrical circuits for different excitations
3. Calculate, measure and know the relation between basic electrical parameters.
4. Analyze the performance characteristics of DC
5. Analyze the performance characteristics AC electrical machines

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

CO 1. Get an exposure to basic electrical laws.
CO 2. Obtain the response of different types of electrical circuits to different excitations.
CO 3. Measure, calculate and relate the basic electrical parameters
CO 4. Obtain the basic characteristics of DC machines
CO 5. Obtain the basic characteristics of transformers and other AC electrical machines.

List of experiments/demonstrations: Any 12 experiments from the following are to be conducted)

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

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18ME12L1- Engineering Workshop

B.Tech. ECE - I Year, II Sem.

L	T	P/D	C
-	-	3	1.5

Prerequisite(s): None.

Course Objectives: Develop ability to

1. Develop a right attitude, team working, precision and safety at work place.
2. Gain a good basic working knowledge required for the production of various engineering products.
3. Provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
4. Know the labour involved, required tools, machinery or equipment with necessary time required in actual working in different trades.
5. Identify and use of marking tools, hand tools, measuring equipment and to work with prescribed tolerances.

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

CO1. Recognize dignity of labour and workshop regulations.
CO2. Study and practice on hand, power tools and their operations.
CO3. Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, and welding.
CO4. Identify and apply suitable tools for different trades of engineering processes including drilling, material removing, measuring, chiseling.
CO5. Perform various basic house wiring techniques.

A) Trades For Exercises:

At least two exercises from each trade:

a. **Carpentry**: T-lap joint, cross lap joint, mortise and tenon joint, Bridle joint, Corner lap joint.
b. **Fitting**: Square joint, V joint, half round joint, dovetail joint, L-Fitting.
c. **Tin-Smithy**: Tray, cylinder, hopper, funnel, Open scoop.
d. **Black Smithy**: Simple exercises such as upsetting, drawing down, punching, bending, swaging and fullering.
e. **House-wiring**: Wiring for two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
f. **Foundry**: Preparation of sand mould using Single Piece pattern, Preparation of sand mould using Split pattern.
g. **Welding Practice**- Single butt joint, Corner Joint, T-filled Joint, Lap Joint.

B) Trades For Demonstration:

a. Plumbing
b. Machine Shop

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage.
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Engineering Workshop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd.
2. Workshop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, Vikas publishers.
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.

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18MA2101– Complex Variables

B.Tech. ECE II Year, I Sem.

Prerequisite(s): 18MA1201 - Mathematics-II

L	T	P/D	C
3	-	-	3

Course Objectives: Develop ability to

1. Understand difference between real and complex valued functions and verify its 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, the student would be able to:

CO1**.** Test analyticity of a given function using Cauchy-Riemann equations and find complex function for given real or imaginary parts.

CO2**.** Apply Cauchy's theorem, Cauchy's integral formula including generalized to evaluate integration of complex valued functions.

CO3. Use Maclaurin's and Laurent series to expand given complex valued functions and test its convergence.

CO4. Compute several kinds of real definite integrals using residue theorem.

CO5**.** 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. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOKS:

1. Complex analysis for Mathematics and Engineering by John H, Jones and Bartlett India Pvt Ltd. New Delhi, 6th Edition.
2. Foundations of Complex Analysis by S. Ponnuswamy, Narosa Publications.
3. Advanced Engineering Mathematics, H.K.Dass, S Chand Publishers.
4. Engineering Mathematics, Srimanta Pal, Subhodh C. Bhunia, Oxford Higher Education.

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18EC2101 - Signals and Systems

B.Tech. ECE II Year, I Sem.

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

Prerequisite(s): 1) 18MA1101 – Mathematics - I
2) 18MA1201 –Mathematics - II

Course Objectives: Develop ability to

1. Distinguish different types of Signals, Systems and basic operations on signals and understand the Fourier series representation of periodic signals.
2. Understand the conversion of both periodic and aperiodic continuous/discrete time domain signal into frequency domain using Fourier transform and the concept of sampling theorem.
3. Understand the characteristics of a linear time invariant system and the concepts of convolution and correlation.
4. Understand usage of Laplace transforms in the analysis of continuous time systems.
5. Understand usage of Z transforms in the analysis of discrete time systems.

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

CO1. Analyze a given signal in Time domain and frequency domain using Fourier series.
CO2. Analyze a given signal/system using Fourier transforms.
CO3. Analyze a given LTI systems and perform convolution / correlation on signals / systems.
CO4. Find response of a LTI System for various input signals using Laplace transforms.
CO5. Analyze a given signal/system using Z transform / domains and solve linear difference equations using Z- transforms.

UNIT – I : Signal Analysis and Fourier Series

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.

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.

UNIT - II : Fourier Transforms and Sampling

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.

Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Types of Sampling - Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

UNIT - III : Signal Transmission through Linear Systems

Linear Time Invariant (LTI) systems, Linear Time Variant (LTV) systems, Transfer function 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, 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 : Analysis of LTI Systems using Laplace Transforms

Review of Laplace transforms, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Pole-zero plots, Properties of Laplace transforms, Laplace transform of certain signals using waveform synthesis. Review of Inverse Laplace transform, response of a LTI system for different inputs using Laplace transforms.

UNIT - V : Z–transforms

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, Pole-zero plots, Properties of Z-transforms, Solution of difference equations using Z transform, Distinction between Laplace, Fourier and Z Transforms.

TEXT BOOKS:

1. B.P. Lathi, "Signals, Systems and Communications", BS Publications, 2003.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems, PHI, 2nd Edn.

REFERENCE BOOKS:

1. Signals and Systems: Continuous and Discrete, Rodger E. Ziemer, William H Tranter , D. R. Fannin**,** 4th Edition, Pearson Education Limited.
2. Signals and systems, Hwei Hsu, Schaum's outlines series, McGraw Hill Professional, 1995
3. Signals and Systems, Simon Haykin and Van Veen, Wiley, 2nd Edition.

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18EC2102 – Digital Design

B.Tech. ECE II Year, I Sem.

L	T	P/D	C
3	-	-/-	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 symmetric functions and design the same using relay contacts.
6. Understand Threshold logic and design switching functions using threshold elements

Course Outcomes: At the end of the course, the 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 logic circuits and the effect of Static Hazards on these circuits.
CO 4. Synthesize symmetric functions using relay contact networks.
CO 5. Design switching circuits using threshold elements.
CO 6. Analyze and Design Sequential logic Circuits.

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 Gates, 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 – Three, 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

Adders, Subtractors, Multiplexers, Realization of Switching Functions using Multiplexers, De-multiplexers, Decoders, Encoders, Priority Encoder, Comparators, Parity Generators, Code Converters. Static Hazards and Hazard Free Realizations.

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. Digital Fundamentals - A Systems Approac", Thomas L. Floyd, Pearson, 2013.
2. Fundamentals of Logic Design, Charles H. Roth, Cengage Learning, 5th Edition, 2004.

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18EC2103 - Circuit Theory

B.Tech. ECE II Year, I Sem.

L	T	P/D	C
3	1	-	4

Prerequisite: 18EE1201- Basic Electrical Engineering

Course Objectives: Develop ability to

1. Understand the transient and steady state response of passive circuits.
2. Understand different types of two-port networks and their interconnection.
3. Understand the behavior of symmetrical and asymmetrical networks and their characteristics.
4. Understand the working principles of various passive filters.
5. Understand the concepts of attenuators and equalizers.

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

CO1. Explain the concepts transient and steady state analysis of RLC circuits.
CO2. Analyze different types of two-port networks and their interconnection.
CO3. Explain the concepts of symmetrical and asymmetrical networks and their characteristics.
CO4. Design various passive filters as per specifications.
CO5. Design various attenuators and equalizers as per specifications.

UNIT-I: Transient and Steady state response of passive circuits:

Transient and steady state response of RL, RC and RLC (series and parallel) circuits for various inputs (independent sources) namely, unit step, impulse, pulse, and sinusoidal waveforms. (quantitative treatment of source-free response and forced response to be covered).

UNIT-II: Two- Port Networks:

Introduction: Impedance (Z), Admittance (Y), Hybrid (h), and Transmission (ABCD) parameters (qualitative treatment only). Condition of Reciprocity and Symmetry. Interconnection of Two-port networks in Series, Parallel and .Cascaded configurations.

UNIT-III: Symmetrical and Asymmetrical Networks:

Introduction to Symmetrical and Asymmetrical networks, Image and Iterative impedances. Image transfer constant and iterative transfer constant. Symmetrical networks: characteristic impedance and propagation constant. Properties of L, T and Pi section types.

UNIT-IV: Passive Filters:

Need of filters in communication engineering, characteristics of filters - Pass band and Stop band, gain roll-off and attenuation. Analysis and design of constant-k filters – low pass, high pass, band pass and band elimination filters. Analysis and design of m-derived filters — low pass, high pass, band pass and band elimination filters. Qualitative treatment on composite filters, crystal filters and lattice filters.

UNIT-V: Special Networks:

Attenuators: Need of attenuators, Analysis and design of Attenuators: Symmetrical T, π and Bridged T attenuators; Asymmetrical attenuators: T, π and L attenuators. **Equalizers:** Need of equalizers, Inverse Impedance and inverse Networks. Full series and shunt equalizers.

TEXT BOOKS:

1. Engineering Circuit Analysis,W H Hayt, J E Kemmerly and S M Durbin, TMH
2. Networks, Lines and Filters, John D. Ryder, PHI Learning.

REFERENCE BOOKS:

1. Circuit Theory, A. Chakrabarti, Dhanpat Rai Educational & Technical Publishers.
2. Engineering Network Analysis and Filter Design, Gopal G. Bhise, Prem R. Chadha and Durgesh C. Kulshreshtha, Umesh Publication

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18EC2104- Electronic Circuit Analysis and Design

B.Tech. ECE II Year, I Sem.

L	T	P/D	C
3	1	-	4

Prerequisite(s): 18PH1201- Semiconductor Devices

Course Objectives: Develop ability to

1. Understand analysis of single and multistage amplifiers in mid, low and high frequency regions, for BJT and FETs.
2. Understand the concept of feedback in an amplifiers and analysis of various feedback amplifiers.
3. Understand the concept of positive feedback in oscillators, analyze and realize R-C, L-C oscillators.
4. Understand large signal amplifiers - Class A, Class B and their power conversion efficiency.
5. Understand the analysis of tuned amplifiers - Single tuned, stagger tuned amplifiers and the effect of cascading of tuned amplifiers on bandwidth.

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

CO 1. Analyze single stage amplifiers at Mid-band, Low frequency and High frequency regions.
CO 2. Analyze multistage amplifiers at Mid-band, Low frequency and High frequency regions.
CO 3. Design and analyze different types of feedback amplifiers and oscillators using transistors
CO 4. Analyze different types of power amplifiers and compare them in terms of efficiency.
CO 5. Analyze tuned amplifiers and the effects of cascading tuned amplifiers.

UNIT –I : Single Stage Amplifiers

Small signal h-parameter model of BJT, Mid-band analysis of Single stage CE amplifier. Effect of coupling and bypass capacitors on the gain of an amplifier. The Hybrid- pi Common Emitter Transistor Model and its analysis, FET low and high frequency models and its analysis. Design of Single stage BJT and FET amplifiers for given specifications.

UNIT –II : Multistage Amplifiers

Cascading of amplifiers and its corresponding frequency response under various coupling methods. Analysis of two-stage RC coupled CE amplifier. Cascode Amplifier and Darlington Pair.

UNIT- III : Feedback Amplifiers And Oscillators

Feedback Amplifiers: Concept of Feedback, Classification of Feedback Amplifiers, Effect of Feedback on Amplifier characteristics. Analysis of Voltage-Series, Voltage-Shunt, Current-Series and Current-Shunt Configurations.

Oscillators: Classification of Oscillators. Conditions for Oscillations. Analysis and design of RC Phase shift oscillators (using BJT and FET). Analysis of Wien–Bridge oscillator. Analysis and design of LC oscillators. Applications of Crystal Oscillator. Stability of Oscillators.

UNIT- IV: Large Signal Amplifiers

Classification of power amplifiers, Class-A Large Signal Amplifiers, Conversion Efficiency of Class-A power Amplifier, Design of Transformer Coupled Class-A Audio Power Amplifier, Conversion Efficiency of Class-B push-pull power Amplifier, Class B power amplifier using Complementary Symmetry.

UNIT- V: Tuned Amplifiers

Analysis and design of Single Tuned Amplifier, Analysis of double tuned amplifiers, Stagger Tuned Amplifiers. Applications of tuned amplifiers.

TEXT BOOKS:

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2nd Edition., 1998, TMH.
2. Electronic Circuits: Discrete and Integrated, Donald L.Schilling and Charle Belove, TMH.

REFERENCE BOOKS:

1. Integrated Electronics, Jacob Millman and Christos C Halkias,1991 Ed., 2008, TMH
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th Edition, 2006, PHI

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18EC21L1– Digital Design Lab

B.Tech. ECE II Year, I Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the functionality of various logic gate ICs
2. Understand the functionality of combinational logic circuit ICs
3. Understand the functionality of Sequential logic circuit ICs
4. Implement the logic functions using Combinational logic Circuit ICs.
5. Realize the sequential logic functions using various ICs.

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

CO1. Analyze the functionality of various logic gates.
CO2. Analyze the operation of various Combinational logic circuit ICs
CO3. Analyze the behaviour of various Sequential logic circuit ICs
CO4. Design and implement combinational logic circuits using ICs on Trainer kits.
CO5. Design and implement Sequential logic circuits using ICs on Bread Boards and Trainer kits.

Note: To perform any twelve experiments choosing at least FIVE from each PART.

Introduction: IC details, connections to the ICs, study the operation of the basic logic gates.

PART A: To Verify the Functionality of the following using Bread-boards / IC kits

1. 4-bit binary Adder (7483).
2. 8x1 Multiplexer (74151).
3. 3-8 Decoders (74138).
4. Decade Counter (7490).
5. Universal Shift Register (74194/195).
6. 4- Bit Comparator (7485)
7. Priority Encoder (74148)

PART B: To design and implement the following logic circuits using basic gates and other ICs

1. Full Adder and Full Subtractor using a) 3 to 8 Decoder, b) 4 to 1 Multiplexer.
2. 4 bit adder/Subtractor using Full Adders.
3. BCD adder using Full Adders
4. Two bit carry lookahead adder using Full Adders.
5. 4 Bit Binary to Gray code converter.
6. BCD to Excess-3 code converter
7. Digital clock using counters for Seconds.
8. Decade counter using a Binary counter.
9. 2 Bit comparator using gates.
10. BCD to 7 segment driver circuit.
11. Design a 4 bit Twisted Ring counter / Johnson counter using 4 bit shift registers.

Equipment required: 1. Digital IC trainer Kits
2. Components: 74XX ICs

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18EC21L2- Electronic Circuit Analysis and Design Lab

B.Tech. ECE II Year, I Sem.

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

Prerequisite(s): 1) 18PH1201- Semiconductor Devices
2) 18PH12L1-Semiconductor Devices Lab

Course Objectives: Develop ability to

1. Obtain the frequency response of amplifiers with and without feedback.
2. Understand the design considerations of amplifiers with and without feedback.
3. Understand the design considerations of oscillators namely, RC phase shift and LC oscillators for a given frequency of oscillations.
4. Understand the conversion efficiency of large signal amplifiers, Class A and Class B.
5. Understand the design considerations of single tuned amplifiers.

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

CO 1. Verify the frequency response of BJT/FET amplifier circuits with and without feedback.
CO 2. Design and verify BJT amplifier circuits with and without feedback for given specifications.
CO 3. Design and verify RC-phase shift and LC oscillators for given frequency of oscillations.
CO 4. Verify the power conversion efficiency of Class-A and Class-B power amplifiers.
CO 5. Design and verify frequency response of a single tuned amplifier.

LIST OF EXPERIMENTS: (A Minimum of TEN Experiments are to be conducted using hardware)

1. Design of single stage RC coupled BJT amplifier
2. Frequency response of two-stage RC coupled FET amplifier
3. Design of Voltage Series Feedback Amplifier
4. Frequency response of Current Series Feedback Amplifier
5. Design of Current Shunt Feedback Amplifier
6. Frequency response of Voltage Shunt Feedback Amplifier
7. Design of RC Phase Shift Oscillator using BJT
8. Design of Hartley Oscillator
9. Design of Colpitts Oscillator
10. Determining efficiency of Class A Power Amplifier
11. Determining efficiency of Class B Complementary- Symmetry Power Amplifier
12. Design of Single tuned amplifier.

Equipment required:

1. Regulated Power Supply (0-30V)
2. CROs (0-20 MHz / 40 MHz / 60 MHz)
3. Functions Generators (0 – 1MHz)
4. Multimeters/Voltmeters
5. Components (Resistors, Capacitors, Diodes, BJTs, FETs, UJTs)
6. Trainer kits/Bread Boards.
7. Power output meter.

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18EC21L3 - Signals and Systems Lab

B.Tech. ECE II Year, I Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

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 similarity between signals /sequences using Correlation.

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

CO1: Synthesize a given waveform using standard test signals and sequences.
CO2: Apply various transformations/operations on independent/dependent variables of a signal/sequence and also determine the even and odd components of a given signal /sequence.
CO3: Convert time domain signal into frequency domain using Fourier transform and plot its magnitude and phase spectrum.
CO4: Classify a system, based on its characteristics and find its response for various excitations.
CO5: Compare the signals/sequences using correlation.

Note: Experiments are to be simulated using SCILAB/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 and Sine.
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. Verification of Gibbs Phenomenon.
5. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
6. Verification of Sampling theorem
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Convolution between a) Signals b) Sequences.
9. Auto and Cross Correlation of (i) Signals (ii) Sequences
10. Waveform Synthesis using Laplace Transform.
11. For the given LTI system, Computation of Unit sample, Unit step and Sinusoidal responses.
12. For an LTI System Locate the poles and zeros in s-plane and z-plane for a given Transfer Function.

13. Removal of noise by Autocorrelation/cross correlation.
14. Verification of physical Realizability and stability for the given LTI System.

Equipment required: 1. Computer Systems
2. SCILAB/OCTAVE or equivalent software.

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18CH2101 – Environmental Science
(Mandatory Course)

B.Tech. ECE II Year, I Sem.

L	T	P/D	C
3	-	-	0

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

CO1. Explain ecosystem and its functions namely, food chain, ecological pyramids etc.
CO2. 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.
CO3. Comprehend ecosystem diversity, its values and importance of hot spots to preserve the same.
CO4. Explain different types of pollution, its control and impact on global environment.
CO5. Recognize various environmental impacts and the importance of various acts and policies towards environmental sustainability.

UNIT-I Ecosystems:

Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, Field visits.

UNIT-II Natural Resources:

Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy Resources-renewable and non-renewable .

UNIT- III Biodiversity And Biotic Resources:

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV Environmental Pollution and Control Technologies:

Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies.

Global Environmental Issues and Global Efforts: Green House Gases And its effect ,Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC- GoI Initiatives.

UNIT-V Environmental Policy, Legislation & EIA:

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economic aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008, PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

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18MB2201 - Management Fundamentals

B.Tech. ECE II Year, II Sem.

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

Prerequisites: None

Course Objectives: Develop ability to

1. Understand the Management Concepts,
2. Understand the planning and decision making functions of management.
3. Understand organizing and staffing functions of management.
4. Learn the concepts of leadership and motivation.
5. Understand controlling function of management.

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

CO 1: Explain the significance of Management in his/her Profession.
CO 2: Explain various Management Functions like Planning and Decision Making.
CO 3: Explain Organizing, Staffing, Human Resource Management and Business Strategy
CO 4: Explain different types of leaderships and Motivation.
CO 5: Explain the aspects of Controlling function of management.

UNIT - I : Introduction to Management

Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT - II : Planning and Decision Making functions of Management

General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT - III : Organization and Human Resources of Management

Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT - IV : Leadership and Motivation

Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team All Leadership.

Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT –V : Control Function Of Management

Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non-Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXT BOOKS:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:

1. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

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18EC2201- Analog and Digital Communications

B.Tech. ECE II Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite: 18EC2101 - Signals and Systems

Course Objectives: Develop ability to

1. Understand the basic concepts of linear continuous Wave modulation schemes
2. Understand basic concepts of Angle Modulation schemes.
3. Understand the concepts of Pulse Modulation schemes and waveform coding Techniques
4. Understand the principles of Digital Carrier Modulation schemes and the fundamental concepts of Source coding techniques.
5. Understand how different types of error control coding techniques used in detecting and correcting the errors.

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

CO1. Explain the concepts of Linear Continuous Wave Modulation Schemes and calculate the Figure of Merit of Normal AM, DSB-SC and SSB-SC schemes.
CO2. Explain the concepts of Angle modulation schemes, generation and detection methods
CO3. Explain the concepts of Pulse modulation schemes and waveform coding techniques
CO4. Explain different digital carrier modulation schemes and develop source coding for a given set of symbols.
CO5. Design encoder and decoder for Linear Block codes and convolution codes.

UNIT – I : Amplitude Modulation And Noise Calculation

Amplitude Modulation : Need for Modulation, Double Sideband Modulation (DSB), Amplitude Modulation (AM), Suppressed Sideband Modulation (SSB). Generation and detection of AM, DSBSC and SSBSC. Power Calculation in AM. AM Radio Broadcasting and Reception.

Noise in AM Systems: Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial noise, 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.

UNIT – II : Angle Modulation and Noise Calculation

Angle Modulation: Frequency Modulation and Phase Modulation , Spectrum of Frequency Modulated Signal, Power and Bandwidth of FM Signal, Generation of FM Signals-Direct and Indirect methods, Demodulation of FM Signal using Phase-Lock Loop. FM Radio Broadcasting and Reception.

Noise in FM System: Threshold effect, Pre-emphasis and De-emphasis in FM.

UNIT – III : Pulse Modulation

Generation and demodulation of Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), Time Division Multiplexing.

Waveform Coding Techniques: Pulse Code Modulation- PCM Generation and Reconstruction, Differential Pulse Code Modulation (DPCM), Delta Modulation (DM) and Adaptive DM.

UNIT – IV : Digital Modulation Schemes

Digital Modulation Schemes :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, BPSK, Coherent PSK Detection, QPSK, Differential PSK.

UNIT – V : Information Theory and Source coding

Amount of Information and Entropy, Channel Capacity, Shannon-Hartley Law, Bandwidth-S/N tradeoff. Need of Source Coding, Shannon- Fano coding, Huffman Coding.

TEXT BOOKS:

1. Digital and Analog Communicator Systems, K. Sam Shanmugam, John Wiley, 2005.
2. Introduction to Analog and Digital Communications, Simon Haykin and Michael Moher, John Wiley & Sons Inc**.** 2nd Edition

REFERENCES:

1. Principles of communication systems, Herbert Taub. Donald L Schiling and Goutam Saha, 3rd Edition, McGraw-Hill, 2008.
2. Modern Digital and Analog Communication Systems, B P Lathi, 3rd Edition, Oxford University Press, 1998.

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18EC2202- Probability Theory and Stochastic Processes

B.Tech. ECE II Year, II Sem.

L	T	P/D	C
3	1	-	4

Prerequisites: 1) 18MA1101- Mathematics-I
2) 18MA1201- Mathematics-II

Course Objectives: Develop ability to

1. Understand the basic concepts of Probability theory and Random variables
2. Understand basic concepts distribution and density functions of Single Random Variable.
3. Understand Multiple Random Variables and their computation of statistical parameters.
4. Understand the concept of random process and its analysis in both time and frequency domain.
5. Understand the relation between the input and output random processes of a Linear Time Invariant System

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

CO1. Explain the concepts of probability and Random variables.
CO2. Distinguish different types of distribution and density functions of a single random variable and compute the statistical averages of a random variables.
CO3. Distinguish between joint, marginal and conditional distribution and density functions of multiple random variables and compute the statistical averages of multiple random variable.
CO4. Explain the concepts of random processes and analyze their parameters in time and frequency domains.
CO5. Derive the relation between input and output random processes of a Linear Time Invariant system.

UNIT – I : Probability and Random Variables

Probability: Introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events

Random Variable : Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

UNIT – II : Operations On A Random Variable

Expectations: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew. Characteristic Function and Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT – III : Multiple Random Variables

Joint Distribution Function, Properties Of Joint Distribution, Marginal Distribution Functions, Conditional Distribution And Density Functions, Statistical Independence, Sum Of Two Random Variables, Sum Of Several Random Variables, Central Limit Theorem (Qualitative Treatment Only)).

Operations On Multiple Random Variables: Correlation, Covariance And Orthogonal.

UNIT – IV : Random Processes :

Temporal Characteristics: Random Process Concept, Classification of Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, N^{th} order and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes.

Spectral Characteristics: The 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.

UNIT – V : Linear Systems With Random Inputs

Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

TEXT BOOKS:

1. Probability, Random Variables and Random Signal Principles, Peyton Z. Peebles, 4th Edition, 2001, TMH.
2. Principles of Communication Systems, Simon Haykin, John Wiley, 2nd Edition,

REFERENCES:

1. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishna Pillai, 4th Edition, TMH.
2. Statistical Theory Of Communication, S.P. Eugene Xavier, New Age International, 1997.

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18EC2203- Linear Integrated Circuits

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

B.Tech. ECE II Year, II Sem.

Prerequisite(s): 18EC2104 - Electronic Circuit Analysis and Design

Course Objectives: Develop ability to

1. Understand the characteristics of Operational Amplifier; Design of differential amplifier, instrumentation amplifier, differentiators, integrators and active filters.
2. Understand waveform generators using µA741 and voltage regulator using µA723.
3. Understand specialized applications of linear ICs: NE/SE 555 Timer and PLL IC 565.
4. Understand the design of various types of DACs and ADCs using op-amps.
5. Understand the design of clippers and clampers using operational amplifier.

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

CO1. Design and analyze various amplifiers and filter circuits using OPAMPs.
CO2. Design and analyze waveform generators using µA741 and voltage regulator using µA723.
CO3. Design Monostable and Astable Multivibrators using NE/SE 555 timer and identify the applications using PLL IC 565.
CO4. Design and analyze DACs and ADCs using various methods.
CO5. Design and analyze clippers and clampers using operational amplifier.

UNIT – I : Operational Amplifier

Operational Amplifier and its DC, AC Characteristics, modes of operation, differential amplifier, instrumentation amplifier. design of Differentiators and Integrators.

Active Filters: Analysis and Design of 1st order Low Pass and High Pass Butterworth Filters.

UNIT -II : Waveform Generators using µA741 and Voltage Regulator using µA723

Comparators, Schmitt Trigger. Waveform generators using µA741– Square, Triangular, Sawtooth and Sine. Design of voltage regulators using µA723.

UNIT – III : Specialized Applications of Linear ICs

NE/SE 555 Timer - Functional Diagram, Monostable Operation and its applications as Frequency Divider and Pulse Stretcher. Astable Operation: Its application as Square Wave Oscillator and Free Running Ramp Generator.

IC565 PLL - Block Schematic, Description of individual Blocks and Applications.

UNIT – IV : Data Converters

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

UNIT – V : Clippers and Clampers using Operational Amplifier

Positive and Negative Clippers, Small-Signal Half-Wave Rectifier, Precision Full Wave Rectifier, Positive and Negative Clampers.

TEXT BOOKS:

1. Op-Amps and Linear Integrated Circuits, Ramakanth A. Gayakwad, PHI, 2003.
2. Linear Integrated Circuits, D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.

REFERENCE BOOKS:

1. Op Amps and Linear Integrated Circuits: Concepts and Applications, James M. Fiore, Cengage Learning, Jaico, 2009.
2. Operational Amplifiers with Linear Integrated Circuits, William D. Stanley, 4th Ed., Pearson Education India, 2009.

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18EC2204- Electromagnetic Theory and Transmission Lines

B.Tech. ECE II Year, II Sem.

L	T	P/D	C
3	1	-/-	4

Prerequisite: 18PH1102 - Applied Physics
18MA1201 - Mathematics - II

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. Understand how the transmission line acts as impedance matching device.

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

CO 1. Explain the concept of static electric and magnetic fields and their applications.
CO 2. Derive Maxwell's equations and explain their applications.
CO 3. Explain the concept of Electromagnetic wave and its characteristics in different propagation media.
CO 4. Define the basic transmission line parameters and derive transmission line equations.
CO 5. Explain the transmission line applications as various circuit elements at RF and UHF.

UNIT – I : Electrostatics

Review of Coordinate Systems, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and its Applications, Electric Potential, Relation between Electric Field Intensity (E) and Potential (V), Maxwell's Equations for Electrostatic Fields, Energy Density.

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 and Spherical Capacitors.

UNIT – II : Magnetostatics

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

Maxwell's Equations for Time varying fields: Faraday's Law of induced emf, Inconsistency of Ampere's Law, Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric– Conductor Interfaces

UNIT – III : EM Wave Characteristics

Wave Equations for Conducting and Dielectric Media, Uniform Plane Wave, Relation Between E and H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors and Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization.

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's Theorem.

UNIT – IV : Transmission Lines – I

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.

UNIT – V : Transmission Lines – II

Input Impedance of a 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.

TEXT BOOKS:

1. Elements of Electromagnetics, Mathew N.O.Sadiku, 4th ed., 2008, Oxford University Press.
2. Electromagnetic Waves and Radiating Systems, E.C.Jordan and K.G.Balmain, 2nd ed., Pearson.
3. Transmission Lines and Networks, Umesh Sinha, Satya Prakashan, New Delhi Tech. India Publications, 2001.

REFERENCE BOOKS:

1. Engineering Electromagnetics, William H. Hayt and John A.Buck, TMH, 7th ed., 2006.
2. Electromagnetics, Joseph A. Edminister and Mahmood Nahvi, 2nd ed., Schaum's Outlines series, McGraw Hill.

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18EC22L1- Analog Communications Lab

B.Tech. ECE II Year, II Sem.

L	T	P/D	C
-	-	2	1

Prerequisite: 18EC2101 - Signals and systems

Course Objectives: Develop ability to

1. Understand various modulation techniques namely, amplitude modulation, frequency modulation, pulse modulation; their demodulation techniques and spectra.
2. Understand the principles of pre-emphasis and de-emphasis circuits used in Frequency Modulation
3. Understand the principle of sampling theorem.
4. Understand the concept of Time division and Frequency division multiplexing and demultiplexing.
5. Understand the principle of Automatic Gain Control

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

CO1. Analyze Amplitude modulation (AM), Frequency Modulation (FM) signal, pulse modulation and demodulation techniques and their spectra using trainer kit.
CO2. Illustrate the principles of pre-emphasis and de-emphasis circuits used in Frequency Modulation
CO3. Illustrate the conversion of analog signal into discrete signal using Sampling Theorem.
CO4. Illustrate Time Division and Frequency division Multiplexing and De-multiplexing using trainer kit.
CO5. Demonstrate the principle of Automatic Gain Control using trainer kit.

List of Experiments: (A minimum of 10 experiments are to be performed)

1. Amplitude Modulation and Demodulation
2. DSB-SC Modulation and Detector
3. SSB-SC Modulator and Detector
4. Frequency Modulation and Demodulation
5. Pre-emphasis and De-emphasis
6. Verification of Sampling Theorem
7. Time Division Multiplexing and De-multiplexing
8. Frequency Division Multiplexing and De-multiplexing
9. Pulse Amplitude Modulation and Demodulation
10. Pulse Width Modulation and Demodulation
11. Pulse Position Modulation and Demodulation
12. AGC Characteristics

Equipment required:

1. RPS (Regulated Power Supply) : 0-30V
2. CROs : 20MHz
3. DSOs : 50MHz
4. Function Generator : 0-1 MHz
5. Lab Trainer Kits(Minimum one of each type) for
   a. Amplitude Modulation and Demodulation
   b. Balance Modulator and Synchronous detector
   c. Single Side Band system
   d. Frequency Modulation and Demodulation
   e. Pre-emphasis and de-emphasis trainer
   f. Analog/digital Time Division Multiplexing and De multiplexing
   g. Frequency Division Multiplexing and De multiplexing
   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

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18EC22L2 – Linear Integrated Circuits Lab

B.Tech. ECE II Year, II Sem.

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

Prerequisite(s): 18EC21L2 - Electronic Circuit Analysis and Design Lab

Course Objectives: Develop ability to understand

1. Linear analog circuits using IC 741
2. Wave shaping circuits employing IC 555 Timer
3. Low and high voltage regulators using IC 723.
4. Frequency Multiplier using PLL IC 565
5. Clipper, Clamper, Half wave and Full Wave Rectifier circuits using IC 741

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

CO1. Linear analog circuits using IC 741
CO2. Wave shaping circuits employing IC 555 Timer
CO3. Low and high voltage regulators using IC 723.
CO4. Frequency Multiplier using PLL IC 565
CO5. Clipper, Clamper, Half wave and Full Wave Rectifier circuits using IC 741

List of Experiments: (Minimum 10 experiments are to be conducted)

Design and Verify the functionality of the following:

1. Summing and Difference Amplifier using OPAMP IC 741.
2. Integrator Circuit and Differentiator circuit using OPAMP IC 741.
3. Zero Crossing Detector and Schmitt Trigger Circuits – using IC 741.
4. Active Filters–1st order Butterworth Low Pass and High Pass Filters using OPAMP IC 741.
5. Waveform Generators using IC 741 – Sine and Square.
6. Monostable Multivibrator and Astable Multivibrator using IC 555.
7. Frequency Multiplier using PLL IC 565
8. Low and High Voltage Regulator using IC 723
9. R-2R ladder 3-bit DAC using IC 741
10. Positive and Negative Clipper Circuits using IC 741 and diodes
11. Half Wave and Full Wave Rectifier using IC 741 and diodes
12. Positive and Negative Clamper Circuits using IC 741 and diodes

Equipment required:

1. Regulated Power Supply (0-30V)
2. Cathode Ray Oscilloscope (20MHz)
3. Function Generators(1 MHz)
4. Multimeters/Voltmeters
5. Components
   a. ICs - 741, 555, 723, 565.
   b. Resistors, Capacitors, Diodes
   c. Breadboards

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18EC22L3 - Simulation Lab

B.Tech. ECE II Year, II Sem

L	T	P/D	C
-	-	2	1

Prerequisite: 18EC21L3 - Signals and Systems Lab

Course Objectives: Develop ability to

1. Understand the moments of a Random Variable
2. Understand the concept of stationarity of a random process.
3. Understand various analog modulation and demodulation schemes.

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

CO1. Write a program to compute different moments of a Random variable
CO2. Identify and remove noise from a signal/sequence using autocorrelation function.
CO3. Verify the relation between auto correlation and power spectral density of a signal.
CO4. Verify various Analog Modulation schemes
CO5. Verify different Pulse modulation schemes.

List of Experiments: (A Minimum of 12 experiments are to be conducted)

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

1. Find and plot the cumulative distribution and probability density functions of a random variable.
2. Finding the moments of a random variable.
3. Verification of central limit theorem
4. Checking the given random process for stationary.
5. Gaussian Random Process
6. Estimation of signal in the presence of noise
7. Verification of Weiner – Khinchine relation
8. Amplitude modulation (AM-DSBFC) and demodulation-study of magnitude spectrum
9. Amplitude modulation (AM-DSBSC) and demodulation-study of magnitude spectrum
10. Frequency modulation and demodulation-study of magnitude spectrum
11. Time division multiplexing and de-multiplexing
12. Pulse Amplitude Modulation
13. Pulse Width Modulation
14. Pulse Position Modulation

Equipment / Software required:

1. PCs
2. SCILAB / OCTAVE or equivalent software.

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18MC2201– Indian Constitution
(Mandatory Course)

B.Tech. ECE II Year, II Sem.

L	T	P/D	C
3	-	-	-

Pre-requisites: None

Course Objectives: Develop ability to

1. Understand the need for a constitution
2. Appreciate the fundamental duties and rights of the citizens of India
3. Explain the role of constitution in a democratic society
4. Describe the Directive Principles of State Policy and their significance
5. List the key features of the constitution, Union Government, and State Governments.

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

CO1. Create awareness about the constitutional values and objectives written in the Indian Constitution.
CO2. List the fundamental rights and fundamental duties of Indian citizens.
CO3. Identify the division of legislative, executive and financial powers between the union and the state governments.
CO4. Understand the working of Indian democracy, its institutions and processes at the local, state and union levels.
CO5. Explain the functions and responsibilities of Election commission of India and Union Public Service Commission.

UNIT – I : Introduction to Indian Constitution

Meaning of the term Constitution, Preamble of the Constitution, Constituent Assembly, The Salient Features of Indian Constitution

UNIT – II : Fundamental Rights of citizen

Fundamental Rights of citizen, Fundamental Duties of citizen, The Directive Principles of State Policy

UNIT – III : Union Government

Union Government , Union Legislature (Parliament) , Lok Sabha and Rajya Sabha (with Powers and Functions) , Union Executive , President of India (with Powers and Functions) , Prime Minister of India (with Powers and Functions) , Union Judiciary (Supreme Court) , Jurisdiction of the Supreme Court.

UNIT – IV: State Government

State Government , State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) , Powers and Functions of the State Legislature , State Executive, Governor of the State (with Powers and Functions) , The Chief Minister of the State (with Powers and Functions) State Judiciary (High Courts)

UNIT – V: Local Self Government

Election Commission of India (with Powers and Functions) , The Union Public Service Commission (with Powers and Functions)

TEXT BOOKS:

1. The Constitution of India, P.M. Bakshi, Universal Law Publishing Co.,
2. Introduction to the Constitution of India, Dr. Durga Das Basu, LexisNexis Publishers, NCERT, Indian Constitution at work.

REFERENCES:

1. Constitution of India, M. Laxmikanth, Cengage Publications.
2. The Indian Constitution, Granville Austin, Oxford India Paperback Edition.

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