GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
(**Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NBA and 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)

Department of Electronics and Communication Engineering
GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana State, Pin Code: 501 301

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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.	Information Technology
VI.	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 $\geq$ 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 (EℓC).

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 (EℓC) 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 (EℓC)	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

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

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 NBA and 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.

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.

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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.

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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 and Coding								
	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.

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 and Simulation 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 Navigation Satellite Systems	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**						

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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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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.

18EN11L1- English Language and Communication Skills 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. 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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Cheeryal (V), Keesara (M), Medchal Dist., Telangana - 501 301

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

$f(x)dx$ (b) $\int_c^{c+2\pi} f(cos\theta, sin\theta)\, d\theta$ (c) $e^{imx} f(x)dx$ (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.

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.
3. Digital Design, Morris Mano, PHl, 3rd Edition

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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 Fields, 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 behavior 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 to IC details, connections to the ICs and digital IC trainer kit.

PART A: To Verify the Functionality of the following using digital IC trainer kits

1. Study the operation of the logic gates using ICs.
2. 4-bit Binary Adder (74283).
3. 8x1 Multiplexer (74151).
4. 3-8 Decoders (74138).
5. 4- Bit Comparator (7485)
6. 8 – 3 line Priority Encoder (74148)
7. Study the operation of Flip-Flops (D, JK) using ICs.
8. Binary Counter (7493).
9. Universal Shift Register (74194/195).

PART B: To design and implement the following logic circuits using ICs on the trainer kit.

1. 4 bit Adder cum Subtractor using Full Adders (74283)
2. BCD Adder using Full Adders (74283)
3. Full Adder and Full Subtractor using:
   a) 3 to 8 Decoder (74138), b) 4 to 1 Multiplexer(74153).
4. 4 Bit Binary to Gray and Gray to Binary code converters using XOR gates.
5. Decade Counter using a Binary counter (7493).
6. Digital Clock using Counters for Seconds/Minutes/Hours.
7. Design a 4 bit Ring Counter / Twisted Ring Counter using 4 bit Shift Registers (74194/74195) and using D-flip flops (7474).

Additional Experiments:

1. BCD to Excess-3 code converter using AOI logic.
2. 2 Bit comparator using gates.
3. BCD to 7-segment driver circuit.
4. Two bit carry lookahead adder using Full Adders.

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 noise effects in AM and FM Systems
4. Understand the concepts of Pulse Modulation schemes and waveform coding Techniques
5. Understand the principles of Digital Carrier Modulation schemes

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

CO1. Explain the concepts of Linear Continuous Wave Modulation Schemes, generation and detection methods
CO2. Explain the concepts of Angle modulation schemes, generation and detection methods
CO3. Explain the noise effects in AM and FM Systems
CO4. Explain the concepts of Pulse modulation schemes and waveform coding techniques
CO5. Explain different digital carrier modulation schemes, generation and detection methods

UNIT – I: Amplitude Modulation

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

UNIT – II: Angle Modulation

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 Receiver

UNIT – III : Noise in AM and FM Systems

Introduction: 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 AM System- Normal AM, DSB & SSB Systems
Noise in FM System: Threshold effect, Pre-emphasis and De-emphasis in FM

UNIT – IV : 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 – V : 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.

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

B.Tech. ECE II Year, II Sem.

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

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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18CS3101 – Operating Systems

B.Tech, ECE, III Year, I Sem

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

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

Course Objectives: Develop ability to

1. Analyze the main components of Operating System (OS) and their working.
2. Introduce the different scheduling policies of OS.
3. State and compare the different memory management techniques.
4. Understand the concepts of input/output, storage and file management.
5. Provide the Understanding of the concepts of Deadlocks and access control methods.

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

CO1: Compare synchronous and asynchronous communication mechanisms in their respective Operating Systems.
CO2: Implement CPU Scheduling algorithms and explain turnaround time, waiting time, response time, throughput for a given set of processes.
CO3: Apply optimization techniques in memory management techniques and analyze them.
CO4: Explain the concepts of input/output, storage and file management
CO5: Demonstrate the concepts of Deadlocks and access control methods.

UNIT I

Operating System Introduction: Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, OS Structure.

UNIT II

Process and CPU Scheduling - Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Schedulers, Context Switch, Preemptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling, Case studies: Linux, Windows.

Process Coordination - Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Case Studies: Linux, Windows.

UNIT III

Memory Management and Virtual Memory- Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table. Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacement Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT IV

File System Interface - The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation - File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation, Efficiency and Performance.

Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap space Management.

UNIT V

Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.
Protection - System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

TEXT BOOK(S)

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.

REFERENCES BOOK(S)

1. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.
2. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
3. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.

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18EC3101 – Microprocessors And Microcontrollers

B.Tech, ECE, III Year, I Sem

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

Pre-requisite(s): 18EC2102 – Digital Design

Course Objectives: Develop ability to

1. Understand the concepts of 8086 microprocessor architecture, addressing modes and programming.
2. Understand interfacing of 8086, with memory and other peripherals.
3. Understand the architecture and features of 8051 Microcontroller, and programming.
4. Understand interrupts, timers/ counters and serial communication modes of8051.

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

CO1. Explain the architecture and modes of operations of 8086 Microprocessor.
CO2. Write assembly language programs (ALPs) for 8086 Microprocessor.
CO3. Design 8251, 8255 interfaces for 8086 Microprocessor.
CO4. Explain the Architecture and features of 8051.
CO5. Design and develop ALP code for 8051 Microcontrollers.
CO6. Explain the operation of the interrupts, timers/ counters and serial communication interface for 8051 Microcontrollers.

UNIT I: 8086 Microprocessor

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

UNIT II: Instruction set and assembly language programming of 8086

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

UNIT III: I/O Interface (**8255-PPI**)

Pin diagram and internal architecture, Modes of operation and interfacing to 8086, Interfacing - keyboard, 7-segment display, D/A and A/D converters.

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

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

UNIT IV: Microcontrollers

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

UNIT V: Interrupts

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

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

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

Text Books:

1. Douglas V. Hall, Microprocessor and interfacing, TMH, 2nd edition2006
2. Kenneth J. Ayala, The 8051 Microcontroller. 3rd Ed., Cengage Learning.

Reference Books:

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

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18EC3102 - Antennas and Wave Propagation

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

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

Prerequisite(s): 18EC2204 - Electromagnetic Theory and Transmission Lines

Course Objectives: Develop ability to

1. Understand radiation mechanisms of various Antennas.
2. Understand various characteristics and parameters of Antennas
3. Understand working principle of antenna arrays
4. Understand various aspects of Antenna Measurements
5. Understand various methods of wave propagation.

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

CO1. Explain radiation mechanism and various parameters of an antenna.
CO2. Design Loop, Helical, Horn and Yagi–Uda antennas.
CO3. Explain the working principle of Microstrip, Reflector and Lens antennas.
CO4. Design different types of arrays and explain the test procedures involved in Antenna Measurements.
CO5. Explain the mechanisms of wave propagation and atmospheric effects on radio wave propagation.

UNIT – I : Antenna Basics & Dipole antennas

Introduction, Basic antenna parameters - Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective height, Fields from oscillating dipole, Field Zones, Polarization – Linear, Elliptical and Circular polarizations, Antenna temperature, Antenna impedance, Front-to-back ratio, Antenna theorem (Reciprocity theorem), Radiation – Potential Functions and the Electromagnetic Field, Potential Functions for Sinusoidal Oscillations - Helmholtz Theorem, The Alternating Current Element, Power radiated by a current element, Radiation from Quarter wave Monopole and Half wave Dipole, Illustrative problems.

UNIT – II: VHF, UHF and Microwave Antennas – I

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

UNIT – III : VHF, UHF and Microwave Antennas – II

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

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

UNIT- IV : Antenna Arrays and Measurements

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

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

UNIT – V : Wave Propagation

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

Text Books:

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

Reference Book:

1. Constantine A.Balanis, "Antenna Theory: Analysis and Design", John Wiley &Sons.

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

18EC3103 - Control Systems Engineering

B.Tech, III Year, ECE, I Sem

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

Prerequisite(s): 18EC2101 - Signals and Systems
18EE1201 - Basic Electrical Engineering
18EC2103 - Circuit Theory

Course Objectives: Develop ability to

1. Understand the principles and applications of control systems.
2. Understand the basic concepts of block diagram reduction methods and signal flow graph techniques.
3. Understand time domain analysis of LTI systems.
4. Understand different aspects of stability analysis of systems in time domain and frequency domain.
5. Understand the concept of state variable analysis of linear continuous-time systems.

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

CO1. Deduce transfer function representation through block diagram algebra and signal flow graphs.
CO2. Determine time response analysis of systems through their characteristic equation and time-domain specifications.
CO3. Analyze the stability of control systems through Routh Hurwitz criteria, Root-Locus, Bode plot, Polar plots and Nyquist criterion.
CO4. Design and analysis of PID controllers, lag, lead, lag-lead compensators.
CO5. Apply state variable approach to linear control systems.

UNIT –I : Introduction

Components of Control Systems, Examples of Control System Applications, Open-Loop and Closed-Loop Control systems, Effects of Feedback: on Gain, Stability, Sensitivity and Noise, Mathematical Models – Differential Equations, Impulse Response and Transfer functions of linear systems, Block Diagram of Control systems, Block Diagram Algebra, Signal Flow Graph and Mason's Gain Formula.

UNIT –II : Time Domain Analysis

Standard test signals - Time Response of First Order Systems, Time Response of Second Order Systems - Time Response Specifications, Steady State Response: Errors and Error Constants, Effects of adding poles and zeros to transfer functions.

UNIT –III : Stability Analysis in S-Domain

The Concept of Stability, Necessary Conditions for Stability, Routh's Stability Criterion, Relative Stability Analysis – Limitations of Routh's Stability. Root Locus Technique: The Root Locus Concept, Construction of Root Loci, Effects of Adding Poles and Zeros to G(s)H(s).

UNIT –IV : Frequency Domain Analysis

Introduction, Frequency Domain Specifications- Resonant Peak, Resonant Frequency and Bandwidth of the Second Order System, Bode Plots, Polar Plots and Nyquist Stability

Criterion, All- pass and Minimum - phase System. Realization of Basic Compensators - Lag, Lead and Lead-Lag Compensators, Cascade Compensation in Frequency Domain, PID Controllers.

UNIT –V : State variable Analysis of Continuous-Time Systems

Concepts of State, State Variables and State Model, Derivation of State Models from Block Diagrams, Diagonalization, Solution of State Equations- State Transition Matrix and it's Properties, Concepts of Controllability and Observability.

TEXT BOOKS:

1. Control Systems Engineering - I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 4th Edition, 2005
2. Automatic Control Systems – B.C. Kuo, 7th Edition, PHI, 2003

REFERENCE BOOKS:

1. Control Systems Theory and Applications - S.K Bhattacharya, Pearson.
2. Control systems - A.Anand Kumar, PHI.

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18EC3104- Principles of Information Theory and Coding

(Professional Elective-I)

B.Tech, III Year, ECE, I Sem

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

Prerequisite(s): 18EC2102- Digital Design

Course Objectives: Develop ability to

1. Acquire the knowledge in measurement of information.
2. Understand the importance of various source codes for communication systems.
3. Understand the implementation of encoder and decoder of linear block codes
4. Understand the implementation of encoder and decoder of Cyclic codes
5. Understand the implementation of encoder and decoder of Convolutional codes

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

CO1. Explain the process of measurement of information and channel capacity
CO2. Develop various source codes.
CO3. Explain the generation of Linear Block codes and design of encoder for linear block codes.
CO4. Explain the generation of Cyclic codes and design of encoder and decoder for cyclic codes
CO5. Explain the generation of convolutional codes and design of encoder and decoder for convolutional codes

UNIT I: Introduction to Information Theory, Mathematical model of Information, A Logarithmic Measure of Information, Average Information (Entropy), Joint and Conditional Entropy, Information Rate and Mutual Information, Channel Capacity, Shannon-Hartley Law, Bandwidth-S/N tradeoff.

UNIT II: Shannon's First Theorem (Lossless Source Coding Theorem), Source Codes - Shannon-fano coding, Huffman coding
Typical data transmission and storage system, Binary Symmetric Channel, Types of Errors and Error Control Strategies,

UNIT III : Linear Block Codes - Introduction to Linear Block Codes-Generator Matrix and Parity Check Matrix, Encoder, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Hamming Codes,

UNIT IV : Cyclic Codes - Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes.

UNIT V : Convolutional Codes - Description of Convolutional Codes, Encoding of Convolutional Codes- Structural and Distance Properties, Representation of Convolutional codes by state diagram, tree diagram and trellis diagram. Maximum Likelihood (ML) decoding- Viterbi Algorithm

TEXT BOOKS:

1. Herbert Taub. Donald L Schiling and Goutam Saha, "Principles of communication systems", 3rd Edition, McGraw-Hill, 2008
2. Shu Lin, Daniel J.Costello Jr, "Error Control Coding- Fundamentals and Applications",
3. Prentice Hall, Inc 2014.

REFERENCES:

1. John G. Proakis, Masoud Salehi, Digital Communication, 5th Ed., McGraw Hill Education (India) Private Ltd, 2018.

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18EC3105 – COMPUTER ORGANIZATION

(Professional Elective – I)

B.Tech, III Year, ECE, I Sem

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

Prerequisite(s): 18EC2102 – Digital Design

Course Objectives: Develop ability to

1. Understand the basic structure and operation of a digital computer.
2. Learn the operation of the arithmetic unit and algorithms for various operations.
3. Understand various instructions, Addressing modes and Instruction codes.
4. Learn different ways of communicating with I/O devices and standard I/O interfaces.
5. Understand the hierarchical memory system, cache memory and virtual memory.
6. Learn the concepts of pipelining and multiprocessing techniques.

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

CO1. Explain Basic structure of a digital computer.
CO2. Demonstrate method of execution of Arithmetic operations on binary numbers.
CO3. Analyze the organization of the Control unit, Arithmetic, Logical unit, Memory unit and the I/O unit.
CO4. Explain Characteristics of multi-processors, pipelining concepts and vector processing.

UNIT I : Basic Structure Of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, introduction to multiprocessors and multi computers.

UNIT II : Register Transfer Language And Micro-operations: Register Transfer language. Register Transfer, Bus and memory transfer, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes, Computer Registers, Computer instructions, Instruction cycle, Memory Reference Instructions.

Central Processing Unit - Stack organization, Instruction formats, Addressing modes, Program control, Reduced Instruction set computer.

UNIT III : Computer Arithmetic: Addition, subtraction, multiplication and Division Algorithms, Floating point Arithmetic operations.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input Output Processor (IOP), Serial communication (PCI, RS232, USB).

UNIT IV : Memory System: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory.

UNIT V: Pipeline And Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration. Inter-processor Communication and Synchronization, Cache Coherence. Introduction to GPU.

Text Books:

1. Computer System Architecture, M. Moris Mano, 3rd Edition, Pearson/ PHI,2007
2. Computer Organization and Architecture, William Stallings 7th Edition, PHI/Pearson.2006

References:

1. Computer Architecture and Organization, John P. Hayes., 3rd McGraw Hill International editions, 1998.
2. Computer Organization, Car Hamacher, ZvonksVranesic, SafwatZaky, 5th Edition, McGraw Hill. 2002

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18EC3106 - Electronic Measurements and Instrumentation

(Professional Elective – I)

B.Tech, III Year, ECE, I Sem

L	T	P/D	C
3	-	-	3

Prerequisite: 18EE1201 –Basic Electrical Engineering

Course Objectives: Develop ability to

1. Understand the characteristics of measurement systems and errors in measurement.
2. Learn the working principle of various signal generators.
3. Understand various DC and AC measuring instruments.
4. Understand the working principle of DC and AC bridge circuits.
5. Understand the operation of a CRO and methods of measuring phase, time and frequency.

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

CO1. Explain the characteristics of measurement systems and errors in measurement.
CO2. Explain the working principle of various signal generators.
CO3. Explain the operations of various DC and AC measuring instruments.
CO4. Explain the working principle of DC and AC bridge circuits.
CO5. Explain the operation of various oscilloscopes and methods of measuring phase, time and frequency.

UNIT - I: Parameters of Measurement Systems: Block diagram of an instrumentation system, Measurement system characteristics, Static characteristics, Accuracy, Precision, Resolution, Sensitivity, Repeatability, Drift and dead zone. Dynamic Characteristics, Fidelity, Lag, speed of response, dynamic error, Classifications of Standards.

UNIT - II: Errors in Measurements and Signal Generators: Limiting errors, Type of error, Gaussian error, probability of errors Statistical analysis. **Signal Generators**: Sine-wave generator, Frequency-synthesized signal generator, Frequency divider generator, Sweep Frequency Generators, Pulse and Square wave generators, Function Generators, AF signal generator.

UNIT - III: Measuring Instruments: DC Indicating Instruments: Suspension Galvanometer, PMMC, DC Voltmeters, DC Ammeters, Voltmeter Sensitivity, Ohmmeters, Multimeters, True RMS Responding Voltmeters. **AC Indicating Instruments:** Electrodynamometers, Rectifier type instruments. **Digital voltmeter** (DVM).

UNIT - IV: Bridges: Introduction, DC Bridges: Wheatstone bridge and Kelvin Bridge. AC Bridges: Maxwell Bridge, Hay Bridge, Schering Bridge, Wein Bridge and Wagner ground connection**.**

UNIT - V: Oscilloscopes: Oscilloscopes block diagram, Cathode ray tube, electrostatic deflection, screens for CRTs, delay line, probes of CRO, phase, frequency and time measurement, Lissajous figures, Multiple trace. **Special Oscilloscope** (Qualitative treatment only)**:** Storage oscilloscope, Sampling oscilloscope, Digital storage oscilloscope (DSOs).

Text Books:

1. A.D. Helfrik, W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 5th Edition, 2003
2. David A Bell, "Electronic Instrumentation and Measurements", Oxford Univ. Press, 1997.

References:

1. A.K. Sawhney, "Electrical and Electronic Measurements and Instrumentation".
2. H.S. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition 2004.
3. K. Lal Kishore, "Electronic Measurements and Instrumentations", Pearson Education, 2010.

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18CS3109 - Scripting Languages

(Professional Elective-I)

B.Tech, III Year, ECE, I Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the concepts of scripting languages for developing Web Scripting.
2. Illustrates object oriented concepts of PERL.
3. Create database connections using PHP and build the website for the world.
4. Analyze the internet ware application, security issues and frame works for application.
5. Understanding of python especially the object oriented concepts.

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

CO1: Apply the concepts of scripting languages for developing Web Scripting.
CO2: Explain the object oriented concepts of PERL.
CO3: Illustrate the PHP Authentication and Methodologies
CO4: Examine the internet ware application, security issues and frame works for application.
CO5: Explain the python object oriented concepts.

UNIT I: Introduction to Scripting - Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages.

UNIT II: Introduction to PERL - Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines. **Advanced PERL:** Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT III: PHP Basics - PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions. **Advanced PHP Programming:** PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, Building Web sites for the World.

UNIT IV: TCL- TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files **Advance TCL:** Eval, source, exec and up level commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. **Tk** - Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

UNIT V: Python: Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. **Integrated Web Applications in Python**- Building Small, Efficient Python Web Systems, Web Application Framework.

Text Book(S)

1. The World of Scripting Languages, David Barron, Wiley Publications.(Unit I II & IV)
2. Beginning PHP and MySQL, Fourth Edition, W Jason Gilmore, Apress Publications (Dream tech.). (Unit III)
3. Python Web Programming, Steve Holden and David Beazley, New Riders Publications. (Unit V)

Reference Book(S)

1. Perl Power, J.RFlynt, Cengage Learning.
2. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
3. PHP and MySQL by Example, E.Quigley, Prentice HalI(Pearson).
4. Tcl and the Tk Tool kit, John K Ousterhout, Pearson Education.
5. Programming Python,M.Lutz.

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18EN31L1 – Advanced English Communication Skills Lab

(Common to all branches - CSE, CE, ECE, EEE and ME)

B.Tech, III Year, ECE, I Sem

Pre-requisite: None

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

Course Objectives: Develop ability to

1 Improve students' fluency in spoken English.
2 Enable them to acquire behavioral skills required for their personal and professional life.
3 Help students develop their vocabulary.
4 Read and comprehend texts and respond appropriately in different socio-cultural contexts.
5 Communicate their ideas.

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

CO1. Acquire vocabulary and use it contextually
CO2. Demonstrate effective Listening and Speaking Skills
CO3. Develop proficiency in academic reading and writing
CO4. Establish employability skills thereby increasing Job prospects
CO5. Communicate confidently in formal and informal contexts

The following Course Content with activities/tasks is proposed for the Advanced English communication Skills (AECS) Lab sessions:

1. **Activities on Fundamentals of Inter-Personal Communication and Vocabulary Building:** Responding appropriately and relevantly using the right body language, Discourse skills, Word Roots, One Word Substitutes, Business Vocabulary, Analogy, Collocations and uses of vocabulary, Resilience and Personal Management, Managing stress, time, anger and other emotions, Assertiveness and Culture shock.
2. **Reading Skills:** Reading for facts, specific information, Reading between the lines, Negative facts, Inferential Reading, Critical Reading.
3. **Activities on Writing:** Writing Process, Gathering Information, Analyzing the content, Formatting, Editing, Resume Writing and C.V preparation, Writing SOP, Letter Writing, email Writing.
4. **Activities on Presentation Skills:** Oral Presentations (Individual and Group), Seminars, PPTs and Written Presentations through posters, Projects, Portfolio Writing, Brochures and Reports.
5. **Activities on Group Discussion and Interview Skills:** Dynamics of Group Discussions, intervention, summarizing, body language, relevance and organization of ideas and rubrics for evaluation, Pre-Interview Planning, opening strategies, answering strategies, Interview through Tele-Conference and Video Conference and Mock Interviews, Videos of Mock Interviews.

Book(s) Recommended :

1. Technical Communication by Meenakshi Raman & Sangeetha Sharma, Oxford University Press, 2009.
2. English Vocabulary in Use series, Cambridge University Press 2008.
3. Communication Skills by Leena Sen , PHI Learning pvt ltd, New Delhi 2009.
4. Communication Skills by Sanjay Kumar and Pushp Lata, 2nd edition, Oxford University Press.

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18EC31L1 – Microprocessors and Microcontrollers Lab

B.Tech, III Year, ECE, I Sem

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

Prerequisite(s): 18EC21L1 – Digital Design Lab
18EC2102 – Digital Design

Course Objectives: Develop ability to

1. Write Assembly Language Programs for various arithmetic and logical operations using 8086.
2. Interface various I/O devices with 8086 processor kits.
3. Write Assembly Language Programs for various arithmetic and logical operations using 8051 microcontroller kits.
4. Interface various I/O devices with 8051 microcontroller kits.
5. Write and execute interfacing programs in Assembly Language for 8086 processor and 8051microcontroller.

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

CO1. Write programs in assembly language using the instruction set of 8086 through MASM software as well as using 8086 Kit.
CO2. Interface different I/O devices with 8086.
CO3. Write programs in assembly language using instruction set of 8051 and execute the same.
CO4. Verify the operations of the timer, counter and serial port (UART) of 8051.
CO5. Interface different I/O devices with 8051.

List of experiments: (Minimum 12 experiments are to be conducted using MASM/ Keil softwares and/or Hardware Kits).

Part A: 8086: Kit and/or MASM Programming (Minimum 4 experiments to be conducted)

1. Programs for 16 bit arithmetic operations (using various addressing modes)
2. Program for sorting an array
3. Program for searching for a number or character in a string
4. Program for String manipulations
5. Program to generate Fibonacci Series

Interfacing with 8086 Microprocessor: (Minimum 3 experiments to be conducted)

6. Interfacing ADC and DAC to8086.
7. Parallel communication between two microprocessors using8255.
8. Serial communication between two microprocessor kits using8251.
9. Verification of various modes of operation of8255.

Part B: (Minimum 5 experiments to be conducted)

8051: Kit and/or Keil Programming

10. Programming using arithmetic, logical and bit manipulation instructions of8051
11. Program and verify Timer/Counter in8051.
12. Program and verify interrupt handling in8051.
13. Verification of UART operation in8051.

Interfacing with 8051 Microcontroller

14. Communication between 8051 kit andPC.
15. Interfacing Keyboard/Display to8051.

Additional Experiments:

1. Interfacing LCD to8051.
2. Wave form generation using Keil.
3. Programs using DOS/BIOS interrupts.

Equipment Required:

1. 8086 Trainer Kits.
2. 8051 Trainer Kits.
3. Interface cards :
   a) 8 bit ADC &DAC,
   b) Experimental card for 8051,
   c) 8251/8253 study cards,
   d) Keyboard/Display,
   e) LCD Display,
   f) 8255 Study card

Software Required:

1. MASM
2. KeilµVision5

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18EC31L2 - Digital Communications Lab

B.Tech, III Year, ECE, I Sem

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

Prerequisite(s): 18EC2201 – Analog and Digital Communications

Course Objectives: Develop ability to

1 Understand various digital modulation techniques through generation and detection of signals.
2 Study the spectral Characteristics of QPSK
3 Understand the generation of (7,4) bit Hamming Code
4 Understand the generation of OFDM signal.

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

CO1. Demonstrate various digital modulation and demodulation techniques
CO2. Analyze the spectral Characteristics of QPSK
CO3: Generate (7,4) bit Hamming code
CO4. Demonstrate the generation of OFDM signals.

List of Experiments:

(At least 10 experiments are to be conducted. Experiments 11 and 12 are compulsory)

1. Pulse Code Modulation (PCM) - Generation and Detection
2. Differential Pulse Code Modulation (DPCM)- Generation and Detection
3. Delta Modulation and demodulation
4. Amplitude Shift Keying: Generation and Detection
5. Frequency shift keying-Generation and Detection
6. Phase Shift Keying-Generation and Detection
7. QAM : Generation and Detection
8. DPSK: Generation and Detection
9. QPSK: Generation and Detection
10. Study of the spectral characteristics of QPSK.
11. Study of Hamming Code – (7,4) bit Generation
12. OFDM Generation and Detection

Equipment required:

1. DSO (0-20 MHz minimum)
2. Function Generators (0.1Hz -1 MHz minimum)
3. Experimental Kits/Modules

18EC3107 – INTERNSHIP

B.Tech, III Year, ECE, I Sem

L	T	P/D	C
-	-	-	2

Pre-requisites: None

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18MB3103 – Professional Ethics

(Mandatory Course)

B.Tech, III Year, ECE, I Sem

L	T	P/D	C
3	-	-	-

Pre-requisites: None

Course Objective: Develop ability to

1. imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.

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

1. understand the importance of Values and Ethics in their personal lives and professional careers.
2. learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT - I

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT - II

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT - III

Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT - IV

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT - V

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and

Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCES:

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

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18CS3211 – Computer Networks

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

1. Develop an understanding of modern network architectures from a design and performance perspective.
2. Understand the protocols of data link layer and MAC sub layer and apply different techniques of error detection and error correction.
3. Distinguish and explain different network layer protocols and routing algorithms.
4. Describe the functions of TCP and UDP protocols.
5. Illustrate the application layer protocols such as HTTP, FTP, SMTP, DNS and TELNET.

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

CO1: Identify the different types of network topologies, protocols and explain the layers of the OSI and TCP/IP model.
CO2: Design a wide-area networks (WANs), local area networks (LANs) and wireless LANs (WLANs) for a given requirement (small scale) based on the market available components and describe the protocols of data link layer and MAC Sub layer.
CO3: Classify and compare the major routing protocols and congestion control algorithms.
CO4: Develop a program for a given problem related to TCP/IP and UDP protocols using network programming.
CO5: Analyze the application layer protocols using open source available software and tools.

UNIT I

Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, TCP/IP Protocol Suite, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks and Virtual Circuit Networks; LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT II

Data Link Layer: Design Issues, Services provided to Network Layer, Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking. Medium Access Control Sub Layer: Random Access, Multiple Access protocols-Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.

UNIT III

Network Layer: Network Layer Design Issues, Logical addressing – IPV4, IPV6 Protocols; Address mapping – CIDR, ARP, RARP, BOOTP and DHCP–Delivery, Forwarding, Uni-Cast Routing protocols, Multicast Routing Protocols.

UNIT IV

Transport Layer: Process to Process Communication, Client/Server Paradigm, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

TEXT BOOK(S)

1. Data Communication and Networking, Fourth Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Computer Networks, Fifth Edition, Andrew S. Tanenbaum, Pearson New International Edition.

REFERENCES BOOK(S)

1. Data and Computer Communication, Eighth Edition, William Stallings, Pearson Prentice Hall India.
2. Internetworking with TCP/IP, Volume 1, sixth Edition Douglas E. Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, Second Edition, Kevin R. Fall, W. Richard Stevens, Pearson Education.
4. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kursoe, K.W.Ross, Fifth Edition, Pearson Education.

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18EC3201- Digital Signal Processing

B.Tech, III Year, ECE, II Sem

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

Prerequisites: 18EC2101- Signals and Systems

Course Objectives: Develop Ability to

1. Understand fundamental concepts involved in the analysis and processing of discrete signals.
2. Distinguish between various discrete -time signals and Systems.
3. Understand frequency domain analysis of discrete signals and systems using DTFT, DFT and FFT tools.
4. Understand the design of Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) filters for a given specifications.
5. Understand Multi-rate signal processing Techniques and finite word length effects.

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

CO1. Perform analysis on discrete time signals and systems in the frequency domain using DFS, DTFT and Z transform
CO2. Compute the DFT of a given discrete time sequence and plot the spectrum respectively.
CO3. Compute radix-2 FFT for a given sequence.
CO4. Design IIR and FIR filters for given specifications
CO5. Convert from one sampling rate to another. Analyze finite word length effects in digital filters.

UNIT-I: Introduction to Digital Signal Processing - Digital Signal Processing and its benefits. Review of Z-Transforms and its applications. **Analysis of Discrete Time Invariant Systems:** Causal Linear Time Invariant Systems (LTI), Stability of LTI Systems, LTI Systems characterized by constant coefficient difference equations, Solution of Linear Constant coefficient difference equations. **Frequency analysis of discrete time signals:** The Fourier series for discrete time periodic signals (DFS), Discrete Time Fourier Transform (DTFT), and Relation between Z-transform, Discrete Fourier Series and Discrete Time Fourier Transform (DTFT).

UNIT-II: Discrete Fourier Transform (DFT) - DFT , properties of DFT and applications, Linear Convolution and Circular convolution, Linear Convolution through circular convolution. Relationship of DFT to other (DTFT and Z-Transforms) transforms, Inverse Discrete Fourier Transform (IDFT), linear convolution of sequences using DFT, Computation of DFT and IDFT. **Fast Fourier Transform (FFT):** Efficient computation of DFT: FFT algorithms, direct computation of DFT, Radix-2 FFT algorithms for decimation in time and decimation in frequency. Divide and conquer approach to computation of DFT (Radix-N FFT algorithm).

UNIT-III: Design of IIR DIGITAL FILTERS - Structures of IIR systems**:** Direct Form I and II, Cascade form and Parallel form structures. Design of IIR Filters from analog filters: Characteristics of commonly used analog filters, Analog filter approximations-Butterworth and Chebyshev, IIR filter design by Impulse invariance, Bilinear Transformation method. Frequency transformations.

UNIT-IV: Design of FIR DIGITAL FILTERS - Structure of FIR Systems**:** Direct form, Cascade realization and Linear phase realization; Characteristics of linear phase FIR filter and its frequency response; Comparison of IIR and FIR filters; Design of linear phase FIR filters using windows method (Rectangular window, Hanning window, Hamming window, Bartlett window and Kaiser window), frequency-sampling method.

UNIT-V: Introduction to Multi-rate Digital Signal Processing - Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D. Multistage implementation of sampling rate conversion. Application of multi-rate signal processing. Introduction to Finite word length effects in fixed point DSP System.

Text Books

1. Digital signal Processing: Principles, Algorithms and Applications-John G.Proakis, D.G.Manolakis, 4thEdition,Pearson/PHI,2009.
2. Digital Signal Processing, S K Mitra,3/e, TMH, 2006.

References

1. Discrete time signal Processing-A.V.Oppenheim and R.W.Schaffer,PHI,2009.
2. Digital signal Processing-A Practical Approach-Emmanuel C.Ifeacher, Barrie.W.Jervis, 2nd Edition, Pearson Education,2009.
3. Fundamentals of Digital signal Processing using MAT Lab-Robert J.Schilling, Sandra L.Harris,Thomson,2007.

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18EC3202- VLSI Design

(Professional Elective - II)

B.Tech, III Year, ECE, II Sem

L	T	P	C
3	-	-	3

Prerequisite(s): 18PH1201 - Semiconductor Devices
18EC2102 – Digital Design

Course Objectives: Develop ability to

1. Understand MOS technology and MOS transistor electrical properties.
2. Understand MOS Circuit Design Processes and layout rules.
3. Understand architectural aspects of VLSI Subsystem.
4. Understand the principles of data path and array subsystems.
5. Understand VLSI design methodology and principles of testing.

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

CO1. Explain MOS technology of NMOS, PMOS, CMOS and BiCMOS.
CO2. Design stick diagrams and draw the layout of a logic circuit.
CO3. Analyze the architectural issues involved in subsystem design.
CO4. Design building blocks of data path subsystems and analyze simple memories using MOS transistors.
CO5. Apply concepts of VLSI design methodology and explain the test principles.

UNIT –I: Introduction to IC Technology: NMOS, PMOS, CMOS and BiCMOS. **Basic Electrical Properties:** Basic Electrical Properties of MOS Circuits: I_{ds}-V_{ds} relationship, Threshold Voltage, g_m, g_{ds}, Figure of merit ω_o. NMOS Inverter: $Z_{p.u}/Z_{p.d}$ ratio, Alternate forms of pull-up. CMOS Inverter.

UNIT -II: MOS Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Lambda based design Rules and Layout, 2μm CMOS Design rules for wires, Contacts and Transistors; Layout Diagrams for NMOS and CMOS Inverters; CMOS Logic Gates and compound gates, Scaling of MOS circuits.

UNIT –III: Subsystem Design: Architectural issues**,** Switch logic: Pass transistors and Transmission gates; Alternate gate circuits: Pseudo nMOS inverter and Domino Logic; Inverter Delays, Driving large capacitive loads, wiring capacitance, Fan–in and Fan–out.

UNIT -IV: Data path Subsystems: Introduction to system design, Adders, ALU, One/Zero Detector, Shifter and Multipliers. **Array Subsystems:** Qualitative analysis of 6T SRAM, DRAM, NAND ROM, Serial Access Memories and Content-addressable memory

UNIT -V: Design Methodology: Programmable Logic, Gate Array and Sea of Gates Design, Cell-based design, Introduction to Full Custom Design and System on a Chip. **CMOS Testing:** Need for testing and Test principles.

Text Books:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Douglas A.Pucknell, Sholeh Eshraghian PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

Reference Books:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. VLSI Design- K.Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.

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18EC3203 - Cellular And Mobile Communications

(Professional Elective-II)

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): 1) 18EC3102 - Antennas and Wave Propagation
2) 18EC2201 – Analog and Digital Communications

Course Objectives: Develop ability to

1. Understand basics of cellular system, their generations and characteristics of mobile communications.
2. Understand co-channel and non-cochannel interferences in mobile communications and their mitigation techniques.
3. Understand the coverage prediction models for different geographical environments (Over water, point-to-point, flat terrain and so on) and antenna requirements at cell site and mobile to improve cell coverage.
4. Understand operational techniques and technologies used in cellular mobile Communication systems to increase traffic capacity.
5. Understand types of handoff mechanism in handling calls in cellular systems, evaluation of dropped calls and intelligent cell concepts like micro cells, MIMO and CDMA and their applications

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

CO1. Explain the cellular system basics, their generations and characteristics of mobile communications.
CO2. Distinguish between the co-channel and non-cochannel interferences, determine the required C/I ratio and propose analytic solutions to reduce the effect of these interferences.
CO3. Evaluate various propagation path-loss models in different geographical environments (Over water, point-to-point, flat terrain and so on) and requirements for cell-site and mobile antennas to improve cell coverage.
CO4. Explain concepts of various assignment schemes and methods to increase traffic capacity.
CO5. Explain types of Handoff strategies; compute associated QoS parameters and intelligent cell concepts.

UNIT – I : Introduction to Cellular Mobile Systems

History of mobile Cellular – AMPs System (First-Generation System), Second-Generation system, 3G systems, 4G systems, Spectrum allocation, Basic Cellular Systems – Circuit switched and Packet Switched systems, Uniqueness of Mobile Radio.

Environment – Description of Mobile Radio Transmission Medium, Model of Transmission Medium, Mobile Fading Characteristics, Active Scattering Region, Standing waves statistics of fading, Delay spread and Coherence Band Width, Noise level in Cellular Frequency Band, Amplifier Noise.

Concept of Frequency Reuse Channels, Co-channel interference Reduction factor, Desired C/I from a normal case in an Omni-directional Antenna system, Handoff Mechanism, cell splitting and Diversity schemes.

UNIT – II: Co-Channel and Non-Co-channel Interference Reduction

Co-channel interference: Exploring co-channel interference areas in a system, Real-Time measurement at mobile Radio Trans receivers, Design of an Omni directional antenna system in the worst case, Design of Directional antenna system, Lowering Antenna Height, Reduction of co-channel interference by means of notch in tilted antenna pattern, Umbrella pattern effect and Diversity Receiver.

Non Co-channel Interference: SINAD, Adjacent Channel Interference, Near-End-Far-End Interference, Effect on Near-end mobile units and Cross talk.

UNIT – III : Cell Coverage and Antennas

General introduction, Obtaining the Mobile Point-to-Point Model (Lee Model), Propagation over water or flat open area, Foliage loss, Propagation in near-in distance, long distance propagation, Obtain path loss from a Point-to-Point Prediction Model (General approach) and its form.

Cell-site and Mobile Antennas: Antennas at cell-site, unique situations of cell-site antennas and mobile antennas.

UNIT – IV : Operational techniques and technologies

Adjusting the parameters of a system**,** Fixed Channel assignment schemes, Non Fixed Channel assignment algorithms, Coverage hole filter, Cell Splitting, and small cells (Micro cells), Narrow Beam concept.

UNIT – V : Hand-Off, Dropped Calls and Intelligent Cell Concepts

Value of Implementing Handoffs, Initiation of a Hard Hand-off, Delaying a Hand-off, Forced Handoffs, Queuing of Handoffs, Power difference Hand-offs, MAHO and Soft Handoff, Intersystem Hand-off. Introduction to Dropped call rates and formula of dropped call rates.

Intelligent Cell Concept: Intelligent cell concept, Applications of intelligent microcell systems, CDMA Cellular Radio Network and MIMO.

TEXT BOOKS:

1. William C.Y. Lee, "Wireless and Cellular Telecommunications", 3rd International ed., McGraw Hill, 2006.
2. Theodore S Rappaport, "Wireless Communications Principles and Practice", 2nd ed., Prentice Hall PTR, 2002.

REFERENCE BOOKS:

1. William C.Y. Lee, "Mobile Communications Design Fundamentals", 2nd ed., Wiley Student Edition (WSE), 2011.
2. Gordon L. Stuber, "Principles of Mobile Communication", 3rd ed., Springer, 2011.

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18EC3204 - Electronic Sensors

(Professional Elective – II)

B.Tech, III Year, ECE, II Sem

L	T	P/D	C
3	-	-	3

Prerequisite: 18EC3106 – Electronic Measurements and Instrumentation.

Course Objectives: Develop ability to

1. Understand the need of transducers/sensors in instrumentation systems.
2. Learn various passive sensors based on resistance, inductance and capacitance.
3. Understand various active transducers.
4. Understand the working principle of few modern sensors.

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

CO1. Select a suitable sensor/transducer for sensing a given physical parameter.
CO2. Explain the principles of sensing and noise in sensors.
CO3. Explain the working principle of various passive transducers.
CO4. Explain the working principle of various active and optoelectronic transducers.
CO5. Explain about modern sensors.

UNIT - I: Introduction to sensors/transducers:

Principles, classifications, selection of a transducer, parameters, characteristics, factors influencing the choice of transducers application and force summing devices.

UNIT - II: Principles of Sensing and noise in sensors

Principles of sensing - Capacitance, magnetism, induction, resistance, piezoelectric effect, hall effect, thermoelectric effect, sound waves, temperature and thermal properties of materials, heat transfer and light. Qualitative treatment on noise in sensors and circuits.

UNIT - III: Passive Transducers

Resistive Transducers: Principles, potentiometric transducer, Strain gauges, resistance thermometers and thermistors.

Inductive Transducers: Principles, magnetostrictive transducer and differential transformer transducers.

Capacitive Transducers: Variable capacitance pressure gauge and capacitor microphone

UNIT - IV: Active Transducers

Thermocouples: Construction of thermocouples, compensation circuits, advantages and disadvantages of thermocouples.

Piezoelectric transducer: Piezoelectric effect, modes of operation, properties, equivalent circuit and **Photovoltaic Cell.**

UNIT - V: Modern sensors (Qualitative treatment only)

Load cell, LDR, Hotwire anemometers, humidity/moisture sensors, integrated circuit temperature sensors, gas/smoke sensor, ultrasonic distance sensor, IR sensor, accelerometers, gyroscopes, liquid level sensor, PH sensor, image sensors and tactile sensors.

Text Books:

1. A.D. Helfrik, W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 5th Edition, 2003
2. Ernest O. Doebelin, "Measurement Systems-Application and Design", TMH, Sixth Edition, July 2017.

References:

1. A.K. Sawhney, "Electrical and Electronic Measurements and Instrumentation".
2. Jacob Fraden, "Handbook of Modern Sensors, Physics, Designs and Applications", Fourth Edition, Springer.

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18CS3212 – Advanced Computer Architecture

(Professional Elective - II)

III Year, B.Tech, ECE, II Sem

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

Prerequisite(s): 18EC3101 – Microprocessors and Microcontrollers
18EC3105 – Computer Organization

Course Objectives: Develop ability to understand

1. Instruction level parallelism
2. Memory hierarchy in computer systems
3. Thread level parallelism
4. Different types of storage systems

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

CO1: Explain different types of Parallelisms in Computer Architectures.
CO2. Design memory hierarchy methods
CO3. Explain the Thread level parallelism
CO4. Explain the different types of Storage systems and bench marking the storage device.

UNIT I: Introduction: Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design.
Instruction level parallelism (ILP) - over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP

UNIT II ILP software approach - compiler techniques- static branch protection - VLIW approach - H.W support for more ILP at compile time- H.W verses S.W Solutions

UNIT III Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

UNIT IV Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.

UNIT V Storage systems- Types – Buses - RAID- errors and failures- bench marking a storage device- designing a I/O system.

Text Book :

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

References :

1. "Computer Architecture and parallel Processing" Kai Hwang and A.Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, DezsoSima, Terence Fountain, Peter Kacsuk, Pearson.
3. Parallel Computer Architecture, A Hardware / Software Approach, David E. Culler, Jaswinder Pal singh with Anoop Gupta, Elsevier

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18EC3205 - Satellite Communications

(Professional Elective - III)

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): 1) 18EC2201 – Analog and Digital Communications
2) 18EC3102 - Antennas and Wave Propagation

Course Objectives: Develop ability to

1. Understand the basics of orbital mechanics, frequency bands and launch vehicles for satellite communication systems.
2. Understand the operation of various sub-systems of communication satellites.
3. Understand the basic transmission theory, propagation effects and design of satellite link.
4. Understand various multiple access techniques for satellite-earth links.
5. Understand the algorithms for satellite packet communication.

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

CO1. Explain the basics of orbital mechanics, frequency bands and launch vehicles for satellite communication systems.
CO2. Explain the operation of various sub-systems of communication satellites.
CO3. Explain the basic transmission theory, propagation impairments and design of satellite link for C, Ka and Ku bands.
CO4. Explain various propagation effects and multiple access techniques for satellite-earth links.
CO5. Explain the algorithms for satellite packet communication.

UNIT – I: Elements of Satellite Communication System

Brief history of satellite communications, Classification of satellites and their applications, overview of satellite communications, Orbital mechanics, Look Angle determination, Orbital Perturbations, Launches and Launch Vehicles, Orbital effects in communications systems performance.

UNIT – II : Satellite Sub-Systems

Satellite Sub-Systems, Attitude and Orbit Control system, Telemetry, Tracking, Command and Monitoring subsystem, Power systems, Communication subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT – III : Satellite Link Design and Propagation Effects

Basic transmission theory, system noise temperature and G/T ratio, design of downlinks, uplink design, design for specified C/N: combining C/N and C/I values in satellite links, Direct Broadcast TV and introduction to HTS, system design for Ku band, uplink and down link design and rain effects at Ku band.

Propagation Effects: Quantifying attenuation and depolarization, propagation effects that are not associated with Hydrometeors, rain and ice effects, Propagation impairment counter measures.

UNIT – IV: Multiple Access Techniques

Multiple Access Techniques: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), On-board Processing, Demand Assignment Multiple Access (DAMA), Random Access, Packet Radio Systems and Protocols, Code Division Multiple Access (CDMA).

UNIT –V: Satellite Packet Communications

Message transmission by FDMA: MI G/i Queue, Message transmission by TDMA, Pure ALOHA-Satellite Packet switching, Slotted ALOHA, Packet reservation.

TEXT BOOKS

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt, "Satellite Communications", 2nd Edition, 2003, John Wiley & Sons.
2. Tri T–Ha, "Digital Satellite Communications", 2nd Edition, 1990, McGraw Hill.

REFERENCE BOOKS

1. Dennis Roddy, "Satellite Communications", 2nd Edition, 1996, McGraw Hill.
2. M. Richcharia, "Satellite Communications - Design Principles", 2003, 2nd Ed., BSP.

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18EC3206 – Digital Signal Processors and Architectures

(Professional Elective - III)

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): 18EC3101 - Microprocessors and Microcontrollers

Course Objectives: Develop ability to

1. Learn the architectural differences between Digital Signal Processor and General purpose processor.
2. Understand the operation of commercial DSP Processors (TMS320C54xx,AD2100 family and Blackfin).
3. Understand various basic algorithms for DSP Processors.
4. Understand method of interfacing memory and I/O peripherals with programmable DSP devices.

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

CO1. Explain the basics of the Digital Signal Processing and the architecture of programmable DSP devices.
CO2. Explain the operation of TMS320C54 processing units.
CO3. Explain the operation and the features of Analog DSP devices and the Blackfin processors.
CO4. Develop various signal processing algorithms on DSP processors.
CO5. Interface memory and I/O peripherals to programmable DSP devices.

UNIT- I : Architecture for Programmable DSP Devices

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues.

UNIT – II : Programmable Digital Signal Processors

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT – III : DSP Devices of Other Manufacturers

Analog Devices Family of DSP Devices, ALU Block Diagram in 2100 ADSP, MAC Block Diagram for AD2100 Family of DSP, Shifter Instruction - Base Architecture of AD2100, ADSP2181 high performance Processor.

UNIT – IV : Implementation of Basic DSP Algorithms

The Q-notation, Overview of FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, An FFT Algorithm for DFT Computation, and Butterfly Computation. Overflow and scaling, Bit Reversed index generation, an 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT – V : Interfacing Memory and I/O Peripherals

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXTBOOKS:

1. Avtar Singh and S. Srinivasan, "Digital Signal Processing", Cengage Learning,2004.
2. K Padmanabhan, S Ananthi and R Vijayarajeswaran, "A Practical Approach to Digital Signal Processing", New Age International publishers, 2001/2013.

REFERENCE BOOKS:

1. B. Venkataramani and M. Bhaskar, "Digital Signal Processors: Architecture, Programming and Applications", Tata McGraw-Hill,2002.
2. Jonathan Stein, "Digital Signal Processing: A Computer Science Perspective", John Wiley & Sons,2005.

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18EC3207 - Digital Design through Verilog HDL

(Professional Elective - III)

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): 18EC2102 – Digital Design

Course Objectives: Develop ability to understand

1. Different technologies related to Hardware Description Languages (HDLs).
2. Basics of Hardware Description Language constructs.
3. The process to compile and execute Verilog HDL programs.
4. Behavioral and RTL modeling of digital circuits using Verilog HDL.
5. The process in the design of digital circuits through Verilog HDL.

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

CO1: Write Verilog Hardware Descriptive Language (HDL) programs using HDL Constructs.
CO2. Design, Implement and Verify Digital Circuits by developing HDL code.
CO3. Synthesize, Implement and Verify Behavioral and Register Transfer Level (RTL) models for Digital Circuits using Verilog HDL.
CO4. Synthesize, implement and verify Gate Level Models using Verilog HDL

UNIT I: Introduction to Verilog HDL: Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools.
Language Constructs and Conventions: Introduction, Keywords, Identifiers, white space characters, Comments, Numbers, Strings, Logic values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.

UNIT II: Gate Level Modeling: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Design of Flip-flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuits. **Modeling at Data flow Level:** Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.

UNIT III: Behavioral Modeling: Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-Blocking Assignments, The case statement, Simulation Flow if and if-else constructs, Assign-De-Assign construct, Repeat construct, for loop, the Disable construct, While loop, Forever loop, Parallel Blocks, Force-Release construct, Event.

UNIT IV: System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT V: Sequential Circuit Description: Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.

Text Books:

1. T R Padmanabhan, B Bala Tripura Sundari, Design through Verilog HDL, Wiley, 2009.
2. ZainalabdienNavabi, Verilog Digital System Design, TMH, 2nd Edition.

Reference Books:

1. Verilog HDL- Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
2. Advanced Digital Design with the Verilog HDL – Micheal D. Coletti, PHI, 2009.
3. Fundamentals of Digital Logic with Verilog Design – Stephen Brown, ZvonkocVranesic, TMH, 2nd Edition, 2010.
4. Digital Design; Principles and practices, Jhon F Wakerly, 4th Edition, Pearson Publication.

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18CS3207 – Neural Networks

(Professional Elective - III)

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the biological neural network and to model equivalent neuron models.
2. Understand the architecture, learning algorithm and issues of various feed forward and feedback neural networks.
3. Understand single and multi-layer-feed-forward network.
4. Understand the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.
5. Understand Neuro dynamical models.

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

CO1: Create different neural networks of various architectures both feed forward and feed backward.
CO2: Perform the training of neural networks using various learning rules.
CO3: Design single and multi-layer-feed-forward network.
CO4: Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.
CO5: Design Neuro-dynamical models.

UNIT I: INTRODUCTION– what is a neural network? Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks. **LEARNING PROCESS 1**-Error-Correction learning, Memory-based learning, Hebbian learning.

UNIT II: LEARNING PROCESS 2- Competitive learning, Boltzmann learning, Credit Assignment Problem, Memory, Adaptation, Statistical Nature of the learning process. **SINGLE LAYER PERCEPTRONS**- Adaptive filtering problem, Unconstrained Optimization Techniques, Linear least-squares filters, Least-mean-square algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron– Perceptron Convergence Theorem, Relation between the perceptron and Bayes Classifier for a Gaussian Environment.

UNIT III: MULTILAYER PERCEPTRON - Back propagation algorithm, XOR problem, Heuristics, Output Representation and Decision rule, Computer Experiment, Feature detection. **BACK PROPAGATION** - Back propagation and differentiation, Hessian Matrix, Generalization, Cross validation, Network Pruning Techniques, Virtues and Limitations of Back propagation Learning, Accelerated convergence of Back propagation Learning, Supervised learning Viewed as an Optimization problem.

UNIT IV: SELF ORGANIZATION MAPS - Two basic Feature-Mapping models, Self-Organization map, Summary of the SOM algorithm, Properties of the Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Pattern Classification, Hierarchal Vector quantization, Contextual Maps.

UNIT V: NEURO-DYNAMICS - Dynamical systems, Stability of Equilibrium States, Attractors, Neuro dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm. **HOPFIELD MODELS -** Hopfield Models, Computer Experiment.

TEXT BOOK(S)

1. Neural networks A Comprehensive Foundation, Simon Haykin, Pearson Education Second Edition.

REFERENCES BOOK(S)

1. Artificial Neural Networks - B.Yegnanarayana PHI Learning Pvt. Ltd.
2. Neural Networks in Computer Intelligence, LiMin Fu TMH.
3. Neural networks: Algorithms, Applications, and Programming Techniques, James A. Freeman, David M. Skapura Pearson Education.

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18CE3221 – Global Warming And Climate Change

(Open Elective – I)

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): None.

Course objectives: Develop ability to

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

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

CO1. Define greenhouse gases and their influence on global warming.
CO2. Explain physical and chemical characteristics of atmosphere and structure of atmosphere. .
CO3. Explain impacts of climate change on agriculture, forestry and ecosystem.
CO4. Explain initiatives taken by countries to reduce global warming.
CO5. Suggest mitigation measures taken to reduce global warming and climate change.

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

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

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

UNIT–IV: Observed changes and its Causes: Climate change and Carbon credits – CDM – Initiatives in India-Kyoto Protocol – Paris Convention - Intergovernmental Panel on Climate change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Global Climate Models (GCM) - Evidences of Changes in Climate and Environment- on a Global scale and in India.

UNIT–V: Climate change and mitigation measures: Clean Development Mechanism – Carbon Trading – Examples of future clean technology – Biodiesel – Natural Compost – Eco-friendly plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry – Carbon sequestration – Carbon capture and storage (CCS) – Waste (MSW & Bio-waste, Biomedical, Industrial waste) – International and Regional cooperation.

TEXT BOOKS:

1. Climate Change: An Indian Perspective (Environment and Development), Dr. Sushil Kumar Dash, Cambridge University Press India Pvt Ltd, 2007.
2. Adaptation and mitigation of climate change – Scientific Technical Analysis, Cambridge University Press, Cambridge, 2006.

REFERENCE BOOKS:

1. Atmospheric Science, J.M. Wallace and P.V Hobbs, Elsevier/ Academic Press, 2006.
2. "Climate Change and Climate Variability on Hydrological Regimes", Jan C. Van Dam, Cambridge University Press, 2003.
3. **http://www.ipcc.ch/**

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18EE3222 – Industrial Safety And Hazards

(Open Elective – I)

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

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

Course Outcomes (COs):

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

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

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

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

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

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

TEXT BOOK (S):

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

REFERENCE BOOKS:

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

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18ME3223– Nano Materials And Technology

(Open Elective - I)

B.Tech, III Year, ECE, II Sem

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

Pre-requisites: None

Course Objectives: Develop ability to
1. Expose the students to a highly interdisciplinary subject
2. Enable the students to understand the basic concepts of Nanotechnology
3. Enhance the knowledge of students in nano materials, properties and their applications

Course Outcomes: At the end of the course, the student will be able to
- **CO1:** Identify nano materials by their superior characteristics
- **CO2:** Demonstrate synthesis of zero dimensional nano structured materials.
- **CO3:** Illustrate conducive methods to synthesize one dimensional nano structures
- **CO4:** Compare and comprehend methods to produce two dimensional nano structures.
- **CO5:** Comprehend synthesis of thin films and special nano materials

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

UNIT II: ZERO DIMENSIONAL NANO-STRUCTURES: Nano particles through homogenous nucleation; Growth of nuclei, synthesis of metallic Nano particles, Nano particles through heterogeneous nucleation; Fundamentals of heterogeneous nucleation and synthesis of nano particles using micro emulsions and Aerosol.

UNIT III: ONE DIMENSIONAL NANO-STRUCTURES: Nano wires and nano rods, Spontaneous growth: Evaporation and condensation growth, vapor-liquid-solid growth, stress induced re-crystallization. **Template based synthesis:** Electrochemical deposition, Electro-phoretic deposition. Electro- spinning and Lithography

UNIT IV: TWO DIMENSIONAL NANO-STRUCTURES: Fundamentals of film growth. Physical vapour Deposition (PVD): Evaporation molecular beam epitaxy (MBE), Sputtering, Comparison of Evaporation and sputtering. **Chemical Vapour Deposition (CVD):** Typical chemical reactions, Reaction kinetics, transportant phenomena, CVD methods, diamond films by CVD.

UNIT V: THIN FILMS: Atomic layer deposition (ALD), Electro-chemical deposition (ECD), Sol-Gel films. **Special Nano Materials**: Carbon fullerence and nano tubes. Carbon fullerness: formation, properties and applications. Carbon nano tubes: formation and applications.

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

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

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18CS3225– Java Programming

(Open Elective I)

B.Tech, III Year, ECE, II Sem

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

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

Course Objectives: Develop ability to

1. Understand the basic concepts of object oriented programming.
2. Identify control statements and write simple java program.
3. Demonstrate interfaces, inner classes and create a package.
4. Evaluate errors, exceptions and inter thread communication.
5. Implement connectivity with database and use file streams.

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

CO1. Apply the concepts of OOPs in problem solving.
CO2. Examine control statements and develop a real time application.
CO3. Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO4. Use Java standard class library with necessary exception handling mechanisms in constructing computer applications.
CO5. Develop java programs using multi-threading, files and database concepts and their connectivity.

UNIT I : OOP Concepts - Data abstraction, Encapsulation, Inheritance, Types of Inheritance and benefits of inheritance, Polymorphism, Classes and Objects, Procedural and Object oriented programming paradigms.

Java Programming – Introduction, History of Java, Comments, Naming Conventions and Data types, Variables, Constants, Scope and life time of variables.

UNIT II : Operators, Operator hierarchy, Expressions, Type conversion and casting, Enumerated types, Control statements in JAVA, Simple java programs, Console input and output, Formatting output, Constructors, Methods, Parameter passing, Static fields and Methods, Access control, this keyword, Overloading methods and Constructors, Recursion, Garbage collection, Building strings, Exploring string class.

UNIT III : Interfaces - Interfaces vs. Abstract classes, Defining an interface, Implementing interfaces, Accessing implementations through interface references, Extending interface.

Inner classes - Uses of inner classes, Local inner classes, Anonymous inner classes, Static inner classes, examples.

Packages - Definition, Creating and Accessing a package, Understanding CLASSPATH, Importing packages.

UNIT IV : Exception handling – Dealing with errors, Benefits of exception handling, Classification of Exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multi-Threading - Differences between multiple processes and multiple threads, Thread states, Creating threads, Interrupting threads, Thread priorities, Synchronizing threads, Inter thread communication.

UNIT V : Files: streams – Byte streams, Character streams, Text input/ Output, Binary input/ output Random access files operations, File management using File class.
Connecting to Database - JDBC Type 1 to 4 drivers, Connecting to a data base, Querying a data base and Processing the results, Updating data with JDBC.

TEXT BOOK(S)

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

REFERENCE BOOK(S)

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

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18MB3226 - Intelectual Property Rights

(Open Elective - I)

B.Tech, III Year, ECE, II Sem

L	T	P/D	C
3	-	-	3

Pre-requisites: None

Course objectives: Develop ability to

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

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

CO1: Acquire knowledge on intellectual property rights
CO2: Track the regulation process of trademark. Discuss the functions of trademark.
CO3: Identify the importance of copyrights, patents searching process and transfer of Ownership
CO4: Know about secret laws, unfair competition, false advertising.
CO5: Reciprocate to new developments of intellectual property rights.

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

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

UNIT - III: Law of Copy Rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right laws. **Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer.

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

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

Text Books

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

References

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

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18CS32L3 – Computer Networks Lab

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

1. Develop an understanding of modern network architectures from a design and performance perspective.
2. Understand the protocols of data link layer and MAC sub layer and apply different techniques of error detection and error correction.
3. Distinguish and explain different network layer protocols and routing algorithms.
4. Describe the functions of TCP and UDP protocols.
5. Illustrate the application layer protocols such as HTTP, FTP, SMTP, DNS and TELNET.

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

CO1: Identify the different types of network topologies, protocols and explain the layers of the OSI and TCP/IP model.
CO2: Design a wide area networks (WANs), local area networks (LANs) and wireless LANs (WLANs) for a given requirement (small scale) based on the market available components and describe the protocols of data link layer and MAC Sub layer.
CO3: Classify and compare the major routing protocols and congestion control algorithms.
CO4: Develop a program for a given problem related to TCP/IP and UDP protocols using network programming.
CO5: Analyze the application layer protocols using open source available software and tools.

List of Exercises:

Week 1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using Crimping tool.
Week 2. Study of different Network devices, IP in details.
Week 3. Connect the computers in LAN, Study of basic network commands and network configuration commands.
Week 4. Study of Network simulator tool and implement IP Address configuration in Network simulator tool.
Week 5. Configure different network topologies using packet tracer/Network Simulator tool.
Week 6.
   a. Write a program to implement the Data link layer framing methods such as character stuffing and bit stuffing.
   b. Write a program to simulate Stop and wait protocol and Sliding Window Protocols.
Week 7. Write a program to implement on a data set of characters using the three Cyclic Redundancy Check Polynomials – CRC 12, CRC 16 and CRC-CCIP.
Week 8. Write a program to simulate Carrier Sense Multiple Access/Collision Detection (CSMA/CD) and Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA).
Week 9. Configure a network using Distance Vector Routing protocol and Link State Routing protocol using packet tracer tool.
Week 10. Implement Dijkstra's algorithm to compute the shortest path through a graph.

Week 11.

a. Write a program to implement Client - Server communication for chat using Transmission Control Protocol (TCP).
b. Using TCP/IP sockets, write a client - server program to make client sending the file name and the server to send back the contents of the requested file if present.

Week 12. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client. characterize file transfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment.

Week 13. Install Telnet on one of the systems connected by a switch and telnet to it from the other system. Using Wireshark tool, capture the packets and analyze the TCP 3-way Handshake for connection establishment and tear down.

Week 14. Using RSA Algorithm Encrypt a Text data and Decrypt the same.

Week 15. Develop a program to implement Ceasar/ Substitution/ Hill cipher techniques.

Softwares used:

- C/ Java/ Equivalent compiler
- Network Simulator like NS2/NS3/CISCO Packet tracer tool/Wireshark tool

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18EC32L1 - Digital Signal Processing Lab

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): 1. 18EC2101 - Signals and Systems
2. 18EC21L3 - Signals and Systems Lab

Course Objectives: Develop ability to

1. Understand the procedure involved in generation of signals.
2. Understand the process of applying DTFT, DFT and FFT on a given signal.
3. Write programs and use DSP hardware for various signal processing applications.
4. Understand the design aspects of FIR and IIR Filters for given specifications.
5. Learn decimation, interpolation and sampling rate conversion.

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

CO1. Describe and demonstrate the use of DFT to efficiently process discrete time signals in the frequency domain.
CO2. Design FIR and IIR Filters for given specifications and analyze Magnitude and phase characteristics.
CO3. Develop DSP Algorithm to estimate power spectral densities of a discrete time sequence.
CO4. Develop DSP Algorithm to estimate and remove noise using a variety of signal processing algorithms.
CO5. Analyze the advantages and working of a multi-rate signal processing systems.

List of Experiments (Minimum 12 Experiments are to be conducted)

The programs shall be implemented employing MATLAB/SCILAB/OCTAVE/CC-Studio or Equivalent in software and DSP processor kits in hardware.

1. Generation of Sinusoidal waveform / signal based on recursive difference equations.
2. To find DFT / IDFT of given DT signal.
3. To find frequency response of a given system given in (Transfer Function/ Differential equation form).
4. Implementation of FFT of given sequence.
5. Determination of Power Spectrum of a given signal(s).
6. To obtain Linear Convolution of two finite length sequences.
7. Design and Implementation of LP FIR filters for given specifications.
8. Design and Implementation of HP FIR filters for given specifications.
9. Design and Implementation of LP IIR filters for given specifications.
10. Design and Implementation of HP IIR filters for given specification.
11. Implementation of Decimation Process.
12. Implementation of Interpolation Process.
13. Implementation of I/D sampling rate converters.
14. Impulse response of first order and second order systems.

Additional Experiments:

1. Generation of DTMF signals
2. Noise removal: Add white noise to a signal and study their spectral characteristics and then remove the noise.

Equipment/Software required:

1. PCs with MATLAB/SCILAB/OCTAVE/CC-Studio or Equivalent
2. DSP Processor kits.

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18EC32L2 - Project Oriented Lab

B.Tech, III Year, ECE, II Sem

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

Prerequisite(s): 18EC31L1 Microprocessors and Microcontrollers Lab

Course Objectives: Develop ability to

Understand interfacing of sensors, actuators and communication modules with 8051 microcontroller, ARM7, Arduino, Raspberry Pi and NodeMCU

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

CO1. Interface sensors, actuators and communication modules with 8051 microcontroller
CO2. Interface sensors, actuators and communication modules with ARM7
CO3. Interface sensors, actuators and communication modules with Arduino
CO4. Interface sensors, actuators and communication modules with Raspberry Pi
CO5. Interface sensors, actuators and communication modules with NodeMCU

List of Experiments: (At least 10 experiments are to be conducted)
(Two experiments from each category)

Using 8051

1. Efficient power saver for street lights using LDR with Solar Power.
2. Intelligent traffic signaling priority system for Ambulances and VIP vehicles.

Using ARM7

3. Voice controlled Robot.
4. Automatic Railway gate control system.

Using Arduino

5. Home appliances control using Bluetooth.
6. Automatic vehicle accident alert system using GSM.
7. Gas leakage detection and automatic control system.

Using Raspberry Pi

8. Image capturing using eye blink detection.
9. Alcohol detection and accident avoidance system.
10. Switching on lights based on human movement detection.

Using NodeMCU

11. Patient health monitoring using IoT.
12. Weather monitoring using IoT.

Equipment Required:

Computers: 15 Nos.
8051, ARM7, Arduino, Raspberry Pi and NodeMCU : 3 Kits each

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18EC4101 - Embedded Systems Design

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

B.Tech, IV Year, ECE, I Sem

Prerequisite(s): 18EC3101 - Microprocessors and Microcontrollers

Course Objectives: Develop ability to
1. Understand design principles of an Embedded System.
2. Understand the operation of ARM Processors.
3. Understand the Instruction set and the programming concepts of ARM.
4. Understand the functions of RTOS.
5. Understand various Task communication methods.

Course Outcomes: At the end of the course, the student would be able to
CO1. Explain the hardware requirements of an Embedded System Design for various applications.
CO2. Explain the functions and features of ARM Processors.
CO3. Develop the programs for ARM Processors in Assembly language.
CO4. Justify the role of Real Time Operating System and its special features in Embedded Systems.
CO5. Explain various methods of Task communication.

UNIT – I : Introduction to Embedded Systems

Definition of Embedded System, Introduction to Real Time Embedded System, Embedded Systems Vs General Computing Systems, Major Application Areas, Purpose of Embedded Systems.

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer. Memory- Types of memories, Memory Shadowing, Memory selection for Embedded Systems. Introduction to Input and Output Peripherals: Sensors and Actuators.

UNIT – II: ARM processor fundamentals

The RISC Design Philosophy, Registers, Current Program Status register, Pipeline, Exceptions, Interrupts and Vector table, Architecture Revisions, ARM Processor Families.

UNIT – III: ARM7 Instruction set

Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program status register Instructions, Basic Programs. Interfacing of I/O Peripherals.

UNIT – IV: Embedded Firmware and RTOS Based Embedded System Design

Embedded Firmware Development Languages, Programming in Embedded C.

Real time Operating System Basics, Types of Real time Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT – V: Task Communication

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers.

TEXT BOOKS

1. "Introduction to Embedded Systems", Shibu K.V, McGraw Hill Education (India) Private Limited, 2009. (For unit 1,4 & 5)
2. "ARM System Developer's Guide: Design and Optimizing System software", Andrew N. Sloss, Dominic Symes, Chris Wright, Morgan Kaufmann Publishers, 2004. (For unit 2&3).

REFERENCE BOOKS

1. "Embedded Systems –Architecture, Programming and Design", Raj Kamal, Tata McGraw Hill, 2008.
2. "Embedded System Design -A Unified Hardware / Software Introduction" Frank Vahid, Tony Givargis, 3rd Edition, John Wiley & Sons, 2002.
3. "ARM System-on-Chip architecture", Steve Furber, 2nd Edition, Pearson Education Limited 2000.
4. "Embedded Systems – An Integrated Approach", Lyla B. Das, Pearson Education, 2013.
5. "An Embedded Software Primer", David E. Simon, Pearson Education 1999.

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18EC4102 - Microwave Engineering

B.Tech, IV Year, ECE, I Sem

L	T	P/D	C
3		- / -	3

Prerequisite: 18EC2204 – Electromagnetic Theory and Transmission Lines

Course Objectives: Develop ability to

1. Understand the electrical characteristics of waveguides and micro-strip lines.
2. Understand the working principles of various microwave components in terms of scattering parameters.
3. Understand the generation and amplification of microwave signal using microwave tubes and solid state devices.
4. Understand the methods of measuring various characteristics of Microwave devices.

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

CO1: Explain the operation of rectangular waveguides, cavity resonators and micro strip lines.
CO2: Explain the properties of S-matrix and analyze the characteristics of microwave components using scattering parameters.
CO3: Explain the operation of Reflex Klystron oscillator and Two cavity klystron amplifier and derive expressions for the output power and efficiency.
CO4: Explain the operation of Magnetron Oscillator and TWT amplifier.
CO5: Explain the operation of various microwave solid state devices and measurement of various parameters of Microwave devices and components.

UNIT – I : Wave Guides and Micro-Strip Lines

Wave Guides: Introduction, Microwave frequencies, Microwave Devices, Microwave systems. Rectangular Waveguides – solutions of wave equations in Rectangular Coordinates, TE modes in rectangular wave guides, TM modes in rectangular waveguides, Impossibility of TEM mode, Power transmission in rectangular wave guides, Power losses in rectangular waveguides.

Micro-Strip Lines: Introduction, Characteristic impedance of Micro strip lines, Losses in Micro strip lines, Quality factor of Micro strip lines.

UNIT – II: Microwave Components

Cavity Resonators: Introduction, Expression for f_0 in a Rectangular Cavity resonator, Applications of Cavity resonator, Quality factor of cavity resonators, Reentrant cavities.

Waveguide Components: Introduction, Waveguide microwave junctions and Scattering parameters: E-plane Tee, H-Plane Tee, Magic Tee, Rat Race Junction, Directional couplers. Waveguide Joints, Wave guide bends, Corners, Transitions and Twists, Waveguide Irises, Posts and tuning screws, Coupling Probes, Coupling Loop, waveguide terminations.

Ferrite Devices: Faraday Rotation in ferrites, Gyrator, Isolator and Circulator.

UNIT – III : Microwave Tubes-I

Introduction, Limitations of Conventional Vacuum tubes at Microwave frequencies (Qualitative treatment only).

Linear beam Tubes (O-Type): Klystron amplifiers - Velocity Modulation Process, Bunching Process, Output power and beam loading. Multi-cavity Klystron Amplifiers, Reflex Klystron - Velocity Modulation, Power Output and Efficiency, Electronic admittance.

UNIT – IV: Microwave Tubes-II

Helix TWTs – Slow wave structures, Amplification Process, Convection current, Axial electric field, Wave Modes, Gain Considerations (Qualitative treatment only).

Microwave Crossed – Field tubes (M-Type): Introduction, Cylindrical Magnetron: Operation in π - mode, Strapping, Applications

Forward - Wave Crossed - Field Amplifier, Backward Wave Oscillator: Operation and Performance Characteristics.

UNIT – V: Solid State Microwave Devices and Microwave Measurements

Solid State Microwave Devices: Transferred Electron Devices – Introduction, Gunn diodes – GaAs diode, Ridley - Watkins - Hilsum (RWH) Theory, Modes of operation.

Avalanche Transit Time Devices: Introduction, IMPATT, TRAPATT diodes.

Microwave Measurements: Microwave Bench general measurement setup, Frequency measurement, Measurement of Power, Attenuation Measurement, Measurement of VSWR, Measurement of Impedance, Measurement of Q of a cavity resonator.

TEXT BOOKS:

1. Samuel Y. Liao , "Microwave Devices and Circuits", PHI, 3rd Edition, 2003.
2. M. Kulkarni, "Microwave and Radar Engineering", Umesh Publications,1998.

REFERENCES:

1. M.L. Sisodia and G.S. Raghuvanshi, "Microwave Circuits and Passive Devices", Wiley Eastern Ltd., New Age International Publishers Ltd.,1995.
2. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, "Microwave Principles", CBS Publishers and Distributors, New Delhi,2004.

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18EC4103 - Optical Communications

(Professional Elective - IV)

IV Year B.Tech, ECE, I Sem

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

Prerequisite(s): 18EC2201 Analog and Digital Communications

Course Objectives: Develop ability to

1. Understand the construction and characteristics of optical fiber cable.
2. Understand optical signal sources and power Coupling
3. Understand the operation of various optical detectors.
4. Understand the design of optical systems.

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

CO 1: Explain and analyze the constructional parameters of optical fibers.
CO 2: Analyze the losses due to attenuation, absorption, scattering and bending.
CO 3: Explain various optical sources, LED structures, quantum efficiency, Laser diodes
CO 4: Compare various optical detectors.
CO 5: Design an optical communication system.

UNIT -I: Overview of Optical Fiber Communication: - Historical development of Optical Communication system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory - Transmission, Reflection, Skew Rays, Cylindrical Fibers- Modes, V number, Mode Coupling, Step Index Fibers, Graded Index Fibers. **Single Mode Fibers-** Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials.

UNIT -II: **Signal Distortion in Optical Fibers:** Attenuation, Absorption, Scattering and Bending Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening. **Optical Fiber Connectors**- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

UNIT -III: **Fiber Splicing**: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints. **Optical Sources**- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD, Power Coupling, Power Launching.

UNIT -IV: **Optical Detectors:** Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation, Error Sources, Digital and Analog Receivers.

UNIT -V: **Optical System Design:** Design Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples, Introduction to WDM.

Text Books:

1. Optical Fiber Communications – Gerd Keiser, TMH, 4th Edition, 2008.
2. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.

References:

1. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.
2. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.

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18EC4104 - Adaptive Signal Processing

(Professional Elective-IV)

B.Tech, IV Year, ECE, I Sem

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

Prerequisite(s): 18EC3201- Digital Signal Processing

Course Objectives: Develop ability to

1. focus on problems, algorithms and solutions for processing signals in an manner that is responsive to a changing environment.
2. Understand systems on recursive, model based estimation methods taking the advantage of the statistical properties of the received signals.
3. Understandtheperformanceofadaptivefiltersandtheapplicationofthetheory toavarietyofpracticalproblemssuchasbeamformingandechocancellationsignal.
4. understand innovation process, Kalman filter theory and estimation of state using the innovation process , concept of Kalman Gain and Filtering.

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

CO 1: Design and apply optimal minimum mean square estimators and in particular linear estimators.
CO 2: Design and apply Wiener Filters (FIR, non-casual, causal) and evaluate their performance.
CO 3: Design and apply steepest decent algorithms to given applications
CO 4: Design and apply LMS algorithms to given applications
CO 5: Design and apply LMS,RLS and Kalman filters to given applications.

UNIT I: Introduction to Adaptive Systems

Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner- Description, Weight Vectors, Desired Response Performance function - Gradient & Mean Square Error.

UNIT II: Development of Adaptive Filter Theory

Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonally-Minimum Mean Square Error, Wiener-Hopf equations, Error Performance - Minimum Mean Square Error, Estimation of phase shift between two narrow band signals using Orthogonal Decomposer.

UNIT III: Steepest Descent Algorithms

Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT IV: LMS Algorithm

Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm.

UNIT V: Recursive Least-Square Adaptive filters & Kalman Filters

Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Filtering , variants of Kalman filter, Extended Kalman filter.

TEXT BOOKS:

1. Adaptive Signal Processing - Bernard Widrow, Samuel D.Strearns, 2005,PE.
2. Adaptive Filter Theory - Simon Haykin-, 4 ed., 2002,PEAsia.

REFERENCES:

1. Optimum signal processing: An introduction - Sophocles. J. Orfamadis, 2 ed.,1988, McGraw-Hill, Newyork
2. Adaptive signal processing-Theory and Applications, S.Thomas Alexander, 1986, Springer–Verlag.
3. James V. Candy, Signal Processing: A Modern Approach, McGraw-Hill, International Edition,1988

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18EC4105 - ASIC Design

(Professional Elective - IV)

B.Tech, IV Year, ECE, I Sem

L	T	P	C
3	-	-	3

Prerequisite(s): 18EC3202 - VLSI Design
18EC3207 - Digital Design through Verilog HDL

Course Objectives: Develop ability to

1. Understand types of ASICs and their programmability.
2. Understand low level design entry schemes and concepts of logic simulation.
3. Understand different aspects of logic synthesis for ASIC design.
4. Understand various steps involved in physical design of an ASIC.
5. Understand various Test architectures for IC design.

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

CO 1: Compare different types of ASICs and explain their programmability.
CO 2: Apply low level design entry schemes and concepts of logic simulation.
CO 3: Apply different aspects of logic synthesis for ASIC design.
CO 4: Perform Floor planning, Placement and Routing of an ASIC.
CO 5: Design various Test architectures for IC design.

Unit I: Introduction to ASICs - Types of ASICs, Design flow, Introduction to System-on-Chip (SoC), Case Study, Economics of ASICs and ASIC Cell Libraries.
Programmable ASICs: Antifuse, SRAM, EPROM, EEPROM Technology, Practical issues, Introduction to Programmable ASIC: Logic Cells, I/O Cells and Interconnects

Unit II: Low-Level Design Entry - Schematic Entry, Low level design languages, EDIF.
Logic Simulation: Types of Simulation, Comparator/MUX example, Logic Systems, How Logic Simulation works, Cell Models, Delay Models, Static Timing Analysis, Formal Verification, Switch Level Simulation and Transistor Level Simulation

Unit III: Logic Synthesis - Introduction, A Logic Synthesis Example, Comparator/MUX example, Inside a Logic Synthesizer, Verilog and Logic Synthesis, FSM Synthesis in Verilog, Memory Synthesis in Verilog.

Unit IV: Floor Planning and Placement - Physical Design Flow, Floor planning: Goals and Objectives, Channel definition, I/O, Power and Clock Planning; Placement: Goals and Objectives, Timing-driven placement method, A simple placement example; Information Formats. **Routing:** Overview of Global Routing, Detailed Routing, Special Routing, Circuit Extraction and DRC

Unit V: Test

Importance of Test, Overview of Boundary Scan Test, Faults, Fault Simulation in ASIC design flow, Automatic Test Pattern Generation, Scan tests, Built-in-Self-Test: LFSR, Signature Analysis and MISR; A simple test example.

Text Book (s)

1. Application Specific Integrated Circuits, M.J.S. Smith, Pearson, 2006
2. Digital Integrated Circuit Design Perspective (2/e), J..M.Rabaey, A. Chandrakasan, and B.Nikolic, PHI 2003

Reference Book

1. Algorithms for VLSI Design Automation, H.Gerez, John Wiley, 1999

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18CS4102 – Machine Learning

(Professional Elective – IV)

B.Tech, IV Year, ECE, I Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand all principal elements of Computational Learning Theory
2. Acquire the knowledge of decision tree and decision tree learning algorithms.
3. Study the concept of neural networks and its algorithms to solve problems using neural networks.
4. Obtain the knowledge of Bayesian reasoning and also instance based learning techniques in order to easily master different Machine Learning models
5. Understand the concept of Genetic algorithms and Genetic Programming

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

CO1: Describe the concepts of computational intelligence like machine learning and design an exemplarily learning system.
CO2: Use the concept of Decision Trees in machine learning models.
CO3: Discuss about the Neural Networks and its usage in machine learning application.
CO4: Apply Bayesian reasoning and also target based learning techniques to develop a machine learning application.
CO5: Summarize the concept of Genetic algorithms and Genetic Programming.

UNIT I: Introduction - Well-posed learning problems, designing a learning system Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Introduction, A concept learning task, concept learning as search, Find-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination algorithm, Remarks on Version Spaces and Candidate Elimination, Inductive Bias

UNIT II: Decision Tree Learning – Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

UNIT III: Artificial Neural Networks - Introduction, Neural Network Representation, Appropriate Problems for Neural Network Learning, Perceptions, Multilayer Networks and the Back propagation Algorithm. Discussion on the Back Propagation Algorithm, An illustrative Example: Face Recognition.

UNIT IV: Bayesian learning - Introduction, Bayes Theorem, Bayes Theorem and Concept Learning Maximum Likelihood and Least Squared Error Hypotheses, Maximum Likelihood Hypotheses for Predicting Probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibs Algorithm Naïve Bayes Classifier, An Example: Learning to Classify Text, Bayesian Belief Networks, EM Algorithm.

Instance-Based Learning: Introduction, k-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

UNIT V: Genetic Algorithms - Genetic algorithms, Representing Hypothesis, Genetic Operators, Fitness function and selection. An illustrative example, Genetic Programming, Models of Evolution and Learning, Parallelizing genetic algorithms.

Reinforcement Learning: Introduction, learning task, Q Learning, Non-Deterministic Actions & rewards, temporal different learning, Generalizing from Examples, Relation to Dynamic Programming

TEXT BOOK(S)

1. Machine Learning, Tom M. Michel, McGraw Hill., 1997.

REFERENCES BOOK(S)

1. The Elements of Statically Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer Veriag, 2001.
2. Machine Learning Methods in the Environmental Science- Neural Networks and Kernels, William W Hsieh, , Cambridge University Press.
3. Pattern Classification, Richard O. Duda, Peter E. Hart and David G. Stork, John Wiley – Interscience, 2001.
4. Neural Network for Pattern Recognition, Christopher M. Bishop, Oxford University Press. 1995.

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18EC4106 - Radar Systems

(Professional Elective – V)

B.Tech, IV Year, ECE, I Sem

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

Pre-requisite(s): 18EC2204 – Electromagnetic Theory and Transmission Lines

Course Objectives: Develop ability to

1. Understand the working principle of radar and its range equation.
2. Understand the working principles of CW and FM-CW radars.
3. Understand the functioning of MTI and Pulse Doppler radars.
4. Understand the working principle of various tracking radars.
5. Understand the concepts of Matched Filter, duplexers and displays.

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

CO 1. Explain the working principle of radar and derive its range equation.
CO 2. Explain the working principle of CW and FM-CW radars.
CO 3. Differentiate between MTI Radar and Pulse Doppler Radar.
CO 4. Explain the working principles of various tracking radars.
CO 5. Explain the operation of Matched Filter, duplexers and displays.

UNIT – I: Basics of Radar

Introduction, Radar Frequencies and Applications, Simple form of Radar Equation, Radar Block Diagram and Operation, Prediction of Range Performance, Minimum Detectable Signal, False Alarm, Receiver Noise, Probability density functions, SNR, Integration of Radar Pulses, Radar Cross Section of Targets, Transmitter Power, PRF and Range Ambiguities, System Losses (Qualitative treatment only), Modified Radar Range Equation.

UNIT – II: CW and Frequency Modulated Radars

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, IF Receiver, Receiver Bandwidth, Applications of CW radar. FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Measurement errors, Multiple Frequency CW Radar.

UNIT – III: MTI and Pulse Doppler Radar

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

UNIT – IV: Tracking Radar and Phased Array Antennas

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Angular Accuracy, Tracking in Range, Acquisition, Comparison of Trackers.

Phased Array Antennas: Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering, Change of Beam Width steering angle, Applications, Advantages and Limitations.

UNIT – V: Radar Receivers

Detection of Radar Signals in Noise: Introduction, Matched Filter Receiver - Derivation of the Matched Filter Characteristic, Correlation Function, Matched Filter with Non-white Noise. Radar Receivers, Displays and Duplexers: Radar Receiver, Noise Figure, Mixers, Displays, Duplexers.

TEXT BOOK

1. Merrill I. Skolnik, Introduction to Radar Systems, TMH Special Indian Edition, 2nd Ed., 2007.

REFERENCE BOOKS

1. M. Kulkarni, Microwave and Radar Engineering, Umesh Publications, 1998.
2. Peebles Jr., P.Z. Wiley, Radar Principles, New York,1998.

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18EC4107- Speech and Audio Processing

(Professional Elective - V)

B.Tech, IV Year, ECE, I Sem

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

Pre-requisite(s): 18EC3201- Digital Signal Processing

Course Objectives: Develop ability to

1. Understand the anatomy and Physiology of Speech Production system and perception model
2. To study the parameters of the speech in time domain such as energy, zero crossing, pitch period etc. and to discriminate speech vs silence.
3. To provide analysis of speech using LPC parameters such as pitch detection and formant analysis.
4. To understand the concept of homomorphic system and its use in extracting vocal tract information using cepstrum and enhancement of speech using spectral substraction, comb filter and wiener filter.
5. To study various Speech and audio Processing applications viz: Speech Recognition, and Speaker Recognition.

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

CO 1: Explain the speech production mechanism and peripheral auditory system.
CO 2: Represent the speech signal in time domain and extract features of speech signals such as energy, zero crossing, pitch period etc.
CO 3: Extract the LPC coefficients that can be used to synthesize or compress the speech.
CO 4: Design a Homomorphic Vocoder for coding and decoding of speech, and apply different speech enhancement techniques
CO 5: Recognize speech and speaker using Machine Learning.

UNIT –I :**Fundamentals of Digital Speech Processing**: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, The Acoustic Theory of Speech Production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals. **Perception**: Anatomical pathways from the Ear to the Perception of Sound, The Peripheral Auditory system, Hair Cell and Auditory Nerve Functions, Properties of the Auditory Nerve. Block schematics of the Peripheral Auditory system.

UNIT –II :Time Domain Models for Speech Processing: Introduction-Time-Dependent Processing of speech, Short time energy and average magnitude Short time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT –III: **Linear Predictive Coding (LPC) Analysis**: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis

Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Unit-IV: Homomorphic Speech Processing:

Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder.

Speech Enhancement: Speech enhancement techniques: Single Microphone Approach, Spectral Subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi Microphone Approach.

Unit-V: Speech and audio processing Applications:

Automatic Speech Recognition: Basic pattern recognition approaches, parametric representation of Speech, Evaluating the similarity of Speech patterns, Isolated digit Recognition System, Continuous word Recognition system. Elements of HMM, Training & Testing of Speech using HMM.

Automatic Speaker Recognition: Recognition techniques, Features that distinguish speakers, MFCC, delta MFCC, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System, Performance Metrics.

TEXT BOOKS:

1. Digital Processing of Speech Signals, Lawrence R.Rabiner& Ronald W.Schafer, Pearson
2. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri, 1st Ed.,PE.

REFERENCE BOOKS

1. Speech&AudioSignalProcessing-BenGold&NelsonMorgan,1stEd.,Wiley
2. Digital Audio Signal Processing – Udo Zolzer, 2ndEdition, Wiley.

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18EC4108 - Mixed Signal Circuit Design

(Professional Elective - V)

B.Tech, IV Year, ECE, I Sem

L	T	P	C
3	-	-	3

Prerequisite(s): 18EC2104 - Electronic Circuit Analysis and Design
18EC2203 - Linear Integrated Circuits
18EC3202 - VLSI Design

Course Objectives: Develop ability to

1. Understand MOSFET Switches and switched capacitor circuits.
2. Understand models of MOS Amplifiers and Comparator Design and its analysis.
3. Gain knowledge on PLLs and Fundamentals of Data Converters.
4. Understand different DAC Architectures.
5. Understand different ADC Architectures.

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

CO 1: Analyze different switched capacitor circuits.
CO 2: Design and analyze MOS amplifier and MOS Comparator.
CO 3: Design Digital PLL and explain concepts of Data Converters.
CO 4: Design and analyze different DACs.
CO 5: Design and analyze different ADCs.

UNIT - I: Dynamic Analog Circuits: The MOSFET Switch-Charge injection, Capacitive feed through, Reduction of charge injection and clock feedthrough; Sample and Hold Circuits.
Switched-Capacitor Circuits: Switched–Capacitor Integrator: Parasitic Insensitive, Summing integrator and Lossy integrator Configurations; Dynamic Comparator.

UNIT - II: Operational Amplifier: Basic Concepts, Basic Op-Amp Design.
CMOS Comparator Design: Pre amplification, Decision Circuit, Output Buffer, Characterizing the Comparator.

UNIT - III: Digital Phase-Locked Loop: Phase Detector, Voltage-Controlled Oscillator, Loop Filter - Overview, Delay-Locked Loops, Design of a 2 GHz DLL.
Data Converter Fundamentals: Analog Versus Discrete Time Signals, Converting Analog Signals to Digital Signals, Sample-and-Hold Characteristics, Digital-to-Analog Converter (DAC) Specifications, Analog-to-Digital Converter Specifications, Mixed-Signal Layout Issues.

UNIT - IV: DAC Architectures - Digital input code, Resistor String, R-2R ladder Networks, Current Steering, Charge-Scaling DACs, Cyclic DAC, Pipeline DAC.

UNIT - V: ADC Architectures - Successive approximation converters, Flash converter, Two-step A/D converters, Pipelined A/D converters, integrating ADC, Oversampling ADC.

Text Book(s):

1. CMOS circuit Design, Layout, and Simulation, R.Jacob Baker, Second Edition, Wiley INDIA Edition, 2005

Reference Books:

1. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Third Edition/Indian Edition, 2013.
2. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002

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18CS4103 – Internet Of Things

(Professional Elective – V)

B.Tech, IV Year, ECE, I Sem

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

Prerequisites: 18CS1101-Programming for Problem Solving
18CS3211- Computer Networks

Course Objectives: Develop ability to

1. Assess the vision and introduction of IoT and understanding how M2M is connected to internet of things
2. Identify the appropriate Hardware and software components of IoT for communication
3. Gain knowledge on Cloud Storage models, web servers and how to integrate device, data and cloud management framework for IoT.
4. Learn the concepts of various data analytics and operational technology security with IoT.
5. Understand advanced and emerging concepts fog computing and Edge computing-IoT

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

CO1: Interpret the vision of IoT from a global context, compare and contrast M2M and IoT Technology
CO2: Relate the appropriate Hardware and software components of IoT for providing the communication among the devices
CO3: Implement device, data and cloud management services for IoT applications.
CO4: Explore various data analytical techniques and operational security for IoT applications.
CO5: Comprehend the need of Fog Computing and Edge Computing-IoT

UNIT I: Introduction to Internet of Things: Definition and Characteristics of IoT, Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT II: Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.
Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT III: IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT
IoT Application Development : Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT IV: Data and Analytics for IoT: Introduction to Big Data Analytical Tools for IoT, Data Analytics for IoT, Edge Streaming Analytics, Network Analytics, Machine Learning for IoT
Securing IoT: Introduction to OT (Operational Technology) security, a brief history and common challenges in OT (Operational Technology) Security,

UNIT V: Introduction To Fog Computing: Fog Computing-Definition-Characteristics-Application Scenarios -Issues -Fog Computing and Internet of Things-Pros and Cons-Myths of Fog Computing -Need and Reasons for Fog Computing Fog Computing and Edge Computing-IoT.

TEXT BOOK(S)

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

REFERENCES BOOK(S)

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Pethuru Raj and Anupama C. Raman, CRC Press.
2. Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, Wiley.
3. Getting Started with the Internet of Things, Cuno Pfister, O Reilly Media.

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

18CE4131 – Building Technology

(Open Elective – II)

B.Tech, IV Year, ECE, I Sem

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

Pre-requisites: None.

Course Objectives: Develop ability to

1. Know the various materials used in the buildings.
2. Understand the building by-laws and ventilation required in the buildings.
3. Estimate the repairs and transportation systems required in buildings.
4. Know the prefabrication and Air condition requirements.
5. Know the plumbing systems required in building.

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

CO 1: Explain characteristics of building materials.
CO 2: Describe the building Bye laws and plan the building.
CO 3: Estimate the repairs in building and types of transportation in building.
CO 4: Assess the prefabrication systems and air conditioning required in buildings.
CO 5: Explain principles of acoustics in building and plumbing.

UNIT – I: Stones: Uses of stones as building materials, Characteristics of good building stones. Types of stones and their significance. **Bricks:** Characteristics of good building bricks. Types of bricks and their significance. **Cement and Concrete:** Ingredients of cement – Types of cement, properties and uses of cement. Overview on concrete.

UNIT – II: Building: Basic definitions, Types, components, economy and design, principles of planning of buildings and their importance, building bye-laws. **Ventilation:** Definitions and importance of circulation; Lighting and ventilation; how to consider these aspects during planning of building.

UNIT – III: Repairs in Buildings: Inspection, control measures and precautions for various construction defects, General principles of design of openings, and various types of fire protection measures to be considered while planning a building. **Vertical transportation in buildings:** Types of vertical transportation, Stairs, different forms of stairs, planning of stair cases, other modes of vertical transportation – lifts, ramps, escalators.

UNIT – IV: Prefabrication systems: Prefabrication systems in residential buildings – walls, openings, cupboards, shelves, etc., planning and modules and sizes of components in prefabrication. **Air conditioning**: Process and classification of air conditioning, Dehumidification. Systems of air conditioning, ventilation, functional requirements of ventilation.

UNIT – V: Acoustics: Acoustics, effect of noise, properties of noise and its measurements, Principles of acoustics of building. Sound insulation – Importance and measures.

Plumbing services: Water supply system, maintenance of building pipe line, Sanitary fittings, principles governing design of building drainage.

Text Books:

1. Building Materials, P.C. Varghese, Prentice Hal India Learning Pvt. Ltd., 2015.
2. Building Construction, B.C.Punmia, Er. Ashok Kumar Jain and Dr. Arun Kumar Jain, Laxmi Publications, 2016.

Reference Books:

1. Building Materials, S.K. Duggal, New Age, 2016.
2. Building Materials, S.S. Bhavikatti, Vikas Publishers, 2016.
3. Engineering Materials and Building Construction, Rangwala, Charotar Publishing House, 2015.
4. A Text book of Building Construction, Arora and Bindra, Dhanpat Rai Publications, 2014.

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18EE4132 – Energy Conservation and Management

(Open Elective – II)

B.Tech, IV Year, ECE, I Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand different basic terms related to Indian Energy Scenario and Energy Conservation Act.
2. Understand the principles of energy conservation, audit and management.
3. Understand energy conservation in different mechanical utilities.
4. Understand efficient heat and electricity utilization, saving and recovery in different thermal and electrical systems.
5. Understand different basic terms related to Energy economy, Financial Management and to understand the role of Energy Service Companies.

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

CO1. Perform energy accounting and balancing
CO2. Prepare energy audit report for different energy conservation instances.
CO3. Suggest energy saving methodologies.
CO4. Evaluate the energy saving and conservation in different mechanical utilities.
CO5. Evaluate the energy saving and conservation in different electrical utilities.

UNIT-I: Energy Scenario, Conservation Act and related policies - Energy Scenario of India. Present Nonrenewable Energy Scenario, Present Energy Consumption, Energy security, Energy strategy for the future.

UNIT-II: Energy Management and Audit - Principles of Energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting – Energy management qualities and functions, language Questionnaire – check list for top management. Definition, energy audit, need, types of energy audit. Energy management (audit) approach – understanding energy costs, Bench marking.

UNIT-III: Energy Efficient Systems-I - Classification of motors - factors affecting efficiency – Energy conservation in motors – Energy efficient motors. **Lighting and Energy Instruments** Good lighting system design and practice, lighting control, lighting energy audit – energy instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT-IV: **Energy Efficient Systems-II - Thermal utilities and systems:** Boilers – types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities.

UNIT-V: Financial Analysis: Simple Payback, Return on Investment, net present value and internal rate of return, life cycle cost method, Sensitivity analysis, Project-financing options, Energy monitoring and targeting.

Text Books:

1. Sonal Desai "Handbook of Energy Audit" McGraw Hill. 2018
2. W.C. Turner "Energy Management Handbook" John Wiley and Sons, A Wiley Inter-science publication.

Reference Books:

1. Albert Thumann "Handbook of Energy Audits", , 6th Edition, The Fairmont Press
2. Bureau of Energy Efficiency Reference book: Vol No.1, 2, 3 4
3. W.R. Murphy and G. Mckay,"Energy Management", Butter Worth Publications
4. Energy Manager Training Manual (4 Volumes) available at https://beeindia.gov.in administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

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18ME4133 – Digital Fabrication

(Open Elective-II)

B.Tech, IV Year, ECE, I Sem

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

Pre-requisites: None

Course Objectives: Develop ability to

1. Introduce basics of geometric modeling of physical objects,
2. Convert digital data to obtain physical components by metal subtraction and addition processes.

Course Outcomes: Upon completion of this course, a student will be able to

CO 1: Select an appropriate geometric modeling scheme required for manufacturing
CO2: Interpret machining operations required in subtractive manufacturing
CO3: Compare additive manufacturing methods and comprehend on the process to be adopted
CO4: Illustrate the robotic applications in manufacturing and assembly
CO5: Select an appropriate polymer by comparing properties and manufacturing requirements

Unit I: Geometric modeling - 2D, 2 ½ D, 3D Modelling; Solid representations-CSG, Boundary representations, VOXEL representations; Overview of digital manufacturing processes

Unit II: Subtractive Manufacturing –Introduction to G codes and M codes; Operations on CNC Lathe- Turning and facing; operations on CNC Mill-Planing, grooving and drilling; Introduction to simple CNC Program (Demonstration only);

Unit III: Additive Manufacturing- Stereo lithography, Selective Laser Sintering, Fused Deposition Modeling; Conversion of Geometric model to .stl for 3D printing (Demonstration only)

Unit IV: Robotic manipulations: Cutting- Laser Cutting, Plasma Cutting, Water jet cutting; bending; folding; stacking; weaving; stitching, Bio printing, Food Printing;

Unit V: Introduction to Engineering polymers- acetals (polyoxymethylenes), ABS, (Acrilonitrile-Butadiene-Suyrene), polycarbonates, polyphenylene ethers and oxides, polyamides (nylons); and thermoplastic polyesthers.

Text books:

1. Digital Fabrication, Philip F. Yuan, Neil Leach, Tonji University press
2. Digital Fabrication in Architecture, Luca Caneparo, Engineering and Construction, Springer

Reference Books:

1. Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing,Gibson, I, Rosen, D W., and Stucker, B., Springer, 2010.
2. Rapid Prototyping – Laser Based and Other Technologies, Venu vinod, PK., Ma, W., Kluwer, 2004.
3. Fundamentals of electronic materials and devices, Safa O Kasap, Mc Graw Hill, 3rd ed

Web Source on free on line course:

1. https://www.classcentral.com/course/kadenze-introduction-to-digital-fabrication-and-technical-design-9440
2. https://nptel.ac.in/courses/112102103/13

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18CS4135 - Knowledge Management

(Open Elective - II)

B.Tech, IV Year, ECE, I Sem

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

Prerequisites: 18CS1201 - Data Structures

Course Objectives: Develop ability to

1. Understand Knowledge Management Systems for access and coordination of Knowledge assets.
2. Understand technologies namely intranet, group-wares, weblog, instant messaging, content management systems and email in both individual and organizational contexts.
3. Use case studies, research methods of Knowledge organization.
4. Understand and implement various knowledge capturing techniques.
5. Test the captured knowledge and to deploy the knowledge.

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

CO1. Evaluate and Implement Knowledge Management Systems to facilitate individual and group work.
CO2. Develop a thorough review of Knowledge Management Concepts, both historical and speculative.
CO3. Originate and distribute research on a Knowledge Management System topic.
CO4. Analyze and design KM processes and Systems.
CO5. Apply Knowledge Management objectives in projects across diverse fields.

UNIT I: Knowledge management - KM Myths –KM Life Cycle- Understanding Knowledge- Knowledge, Intelligence –Experience-Common Sense-Cognition and KM-Types of Knowledge-Expert Knowledge-Human Thinking and Learning.

UNIT II: Knowledge management system life cycle : Challenges in Building KM Systems – Conventional KM System Life Cycle(KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

UNIT III: Capturing knowledge: Evaluating the Expert – Developing a Relation Ship with the Experts – Fuzzy Reasoning and Quality of Knowledge – Knowledge Capturing Techniques , Brain Storming – Protocol Analysis – Consensus Decision Making – Report Grid – Concept Mapping – Black Boarding.

UNIT IV: Knowledge codification: Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developers Skill Sets – System Testing and Deployment – Knowledge Testing - Approaches to Logical Testing, User Acceptance Testing – KM Systems Deployment Issues – User Training – Post Implementation.

UNIT V: Knowledge transfer and sharing: Transfer Methods - and Role of the Internet – Knowledge Transfer in the e-World – KM System Tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing Knowledge Workers.

Text Book(S)

1. Knowledge Management, Elias.M.Awad & Hassan.M.Ghaziri, Pearson Edition.

Reference Book(S)

1. Knowledge Engineering and Management, Guus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, Universities Press, 2001.
2. Handbooks On Knowledge Management, C.W.Holsapple, International Handbooks on Information Systems, Vol 1 and 2, 2003.

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18MB4136 - Supply Chain Management

(Open Elective - II)

B.Tech, IV Year, ECE, I Sem

L	T	P/D	C
3	-	-	3

Pre-requisites: None

Course Objectives: Develop ability to

1. Distinguish the different functional areas in businesses management; understand the cross functional integrations and map supply chains of various business sectors.
2. Identify different types of distribution/ modes of transport/ network design.
3. Analyze the operational issues in SCM.
4. Recognize the drivers of supply chain.
5. Interpret the importance of relationships with suppliers and customers.

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

CO 1: Understand the role of an Engineer as well as Manager in Supply chain management
CO 2: Appreciate the importance of logistics in integrating different functional areas.
CO 3: Integrate operations with functional areas.
CO 4: Visualize the role of logistics and distribution as supply chain drivers
CO 5: Understand the importance of supplier and customer relationship management.

Unit I: Introduction to Supply Chain Management - Understanding the Supply Chain, Supply Chain Performance: Achieving Strategic Fit and Scope including: Customer and Supply Chain Uncertainty, Competitive and Supply Chain Strategies, Product development strategy, Marketing and sales strategy, Supply chain strategy, Scope of strategic fit; Supply Chain Drivers and Metrics.

Unit II: Logistics Management - Designing distribution networks and applications to e-Business, Network design in the Supply Chain, Designing global supply chain, network design, 3 PL, 4 PL, Transportation in supply chain management.

Unit III: Planning and managing inventories - Managing Economies of Scale in a Supply Chain: Cycle Inventory, Managing Uncertainty in a Supply Chain: Safety Inventory, Determining the Optimal Level of Product Availability. Demand Forecasting in a Supply Chain, Aggregate Planning in a Supply Chain, Sales and Operations Planning: Planning Supply and Demand in a Supply Chain, Coordination in a Supply Chain. E- Procurement, Global alliances.

Unit IV: Managing Cross-Functional Drivers in a Supply Chain - Importance of sourcing decisions in Supply Chain Management, Price and Revenue management, role of Information Technology in a Supply Chain, Sustainability and the Supply Chain. Customer Relationship management.

Unit V: Logistics and supply chain relationships - Identifying logistics performance indicators- channel structure- economics of distribution- channel relationships- logistics service alliance. Managing global logistics and global supply chains: Logistics in a global economy- Views of global logistics- global operating levels interlinked global economy. Global supply chain, Supply chain management in Global environment Global strategy- Global purchasing- Global logistics- Global alliances- Issues and Challenges in global supply chain management.

Text Books:

1. Sunil Chopra, Peter Meindle, D.V Kalra, Supply Chain Management 6/e, Pearson.
2. Donald J. Bowersox and David J. Closs, Logistics Management: The Integrated Supply Chain Process, TMH, 2006.
3. Sridhara Bhat: Logistics and Supply Chain Management, EXCEL, 2009.

Reference: 1. The Toyota Way Paperback by Jeffrey Liker.

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18EC41L1- Embedded Systems Lab

B.Tech, IV Year, ECE, I Sem

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

Prerequisite: 18EC31L1 – Microprocessor and Microcontrollers Lab

Course Objectives: Develop ability to

1. Use ARM Controller (LPC2148) Kit for conducting various operations.
2. Program LPC2148 for various applications.
3. Interface LPC2148 with displays and ADC/DACs.
4. Interface Arduino and Raspberry Pi modules with motors.

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

CO1. Write programs for different types of operations using LPC2148.
CO2. Interface LPC2148 with displays and ADC/DACs.
CO3. Use software namely, Keil µvision and Flash Magic.
CO4. Write programs for Interfacing Motors with Arduino and Raspberry Pi boards.

List of Experiments: A minimum of 12 experiments are to be conducted (Minimum Two experiments out of 13,14,15 & 16th experiments, are mandatory)

1. Programs for arithmetic and logical operations for LPC2148
2. Program for finding largest number in an array for LPC2148.
3. Program for finding LCM of two numbers for LPC2148.
4. Program to generate Fibonacci Series using LPC2148.
5. Program to generate Multiplication Table of a number using LPC2148.
6. LED Blinking using LPC2148.
7. Buzzer Interfacing with LPC2148.
8. LCD interfacing with LPC2148.
9. Interfacing of temperature sensor with LPC2148.
10. Memory testing (Read and Write) of LPC2148.
11. Testing of I/O peripherals (ADC and DAC) of LPC2148.
12. Establishing Serial communication between LPC2148 and PC using UART.
13. Ultrasonic sensor and DC motor interfacing with Arduino.
14. GSM / GPS interfacing to Arduino
15. IR and servo motor interface to Raspberry Pi.
16. LDR sensor and LED interfacing to Raspberry Pi.

Software Required:	**Hardware required:**
1. Keil µvision-3 2. Flash Magic 3. Arduino IDE	1. Computer Systems 2. LPC 2148 trainer kits (along with sensors and actuators) 3. Arduino Kits 4. Raspberry Pi kits 5. Actuators (Servo motor, DC Motor, LED) 6. Sensors (LDR, IR, Ultrasonic) 7. GSM Module, GPS Module

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18EC41L2 - Microwave Engineering Lab

B.Tech, IV Year, ECE, I Sem

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

Prerequisite(s): 18EC2204 – Electromagnetic Theory and Transmission lines

Course Objectives: Develop ability to
1. Work with various microwave sources and devices.
2. Calculate the scattering parameters of different microwave devices.
3. Calculate wave guide parameters.

Course Outcomes: At the end of the course, the student would be able to
CO1. Verify the characteristics of microwave sources experimentally.
CO2. Measure various waveguide parameters.
CO3. Verify experimentally the scattering matrices of various microwave devices.

List of Experiments:
1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement
5. Measurement of Waveguide Parameters
6. Measurement of Impedance of a given Load.
7. Measurement of Scattering parameters of a E-plane and H-plane Tee
8. Measurement of Scattering parameters of a Magic Tee
9. Measurement of Scattering parameters of a Circulator
10. Measurement of Scattering parameters of a Isolator
11. Attenuation Measurement
12. Microwave Frequency Measurement.

Equipments required:
1. Microwave Bench set up with Klystron Power Supply.
2. Microwave Bench set up with Gunn Power Supply.
3. Micro Ammeter.
4. VSWR meter.
5. Microwave components
6. Cathode Ray Oscilloscope (20MHz)

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18EC41L3 – EDA Tools and Simulation Lab

IV Year, B.Tech. ECE, I Sem

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

Course Objectives: Develop ability to

1. Learn simulation procedures for understanding electrostatic fields and radiation pattern of antennas.
2. Study the transient response of a given system.
3. Understand the simulation concepts of frequency response of amplifiers, filters.
4. Learn the simulation methods for generating various signals using ICs 741 and 555.

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

CO1. Simulate and analyze the electrostatic fields and radiation pattern of antennas.
CO2. Obtain the transient response of given system.
CO3. Design and simulate the frequency response of various electronic circuits and systems.
CO4. Design and simulate various signal generation circuits using ICs 741 and 555.

LIST OF EXPERIMENTS

PART – A (Minimum 4 experiments are to be conducted)

Experiments using MATLAB/ Octave or Equivalent Software

1. Generation of 3- dimensional Radiation Pattern for a dipole antenna.
2. Generation of Radiation Pattern for linear array antenna.
3. Simulation of Electrostatic fields in free space.
4. Study the performance of First order and second order systems.
5. Study the effect of PI & PD Controller on the system performance.
6. Determination of Gain Margin, Phase Margin and hence analyze the stability of a given system using Bode Plot.

PART – B (Minimum 8 experiments are to be conducted)

Experiments Using Multisim/ Pspice or Equivalent Software

1. Verify the frequency response of two stage RC coupled amplifier.
2. Verify the frequency response of voltage shunt feedback amplifier.
3. Design and Verify RC phase shift Oscillator using BJT for a given frequency of oscillations
4. Design and Verify the frequency response of a single tuned amplifier for a given resonant frequency.
5. Design and Simulation of Constant – K Low Pass filter
6. Design and Simulation of Attenuator
7. Simulation of transient response of Second Order System
8. Design and Simulate LPF, HPF Active filters (second order Butterworth)
9. Design and Simulate generation of Sine, Square and Triangular waves using IC 741.
10. Design and Simulate Monostable and Astable Multi-vibrator using IC 555 Timer.

Equipment Required:

Computers: 30
Software: As indicated above

18EC4109 – MINI PROJECT

B.Tech, IV Year, ECE, I Sem

L	T	P/D	C
-	-	-	2

Prerequisites: None

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18MB4202 – Engineering Economics and Accounting

B.Tech, IV Year, ECE, II Sem

L	T	P/D	C
3	-	-	3

Prerequisites: None

Course Objectives: Develop the ability to
1. Learn the basic Business types, impact of the Economy on Business and Firms specifically.
2. Analyze the Business from the Financial Perspective.

Course Outcomes: At the end of the course student would be able to
CO 1: Understand the fundamentals of economics and concepts of business cycle.
CO 2: Gain knowledge on flow of demand and supply.
CO 3: Identify the different market structures.
CO 4: Understand the fundamental accounting concepts.

UNIT – I: Introduction to Business and Economics - Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance. Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II: Demand and Supply Analysis - Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT- III: Production, Cost, Market Structures & Pricing, Production Analysis - Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions.
Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition.
Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT – IV: Capital Budgeting - Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital – Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (AR A) and Net Present Value Method (simple problems).

UNIT – V: Financial Accounting - Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
4. S.N.Maheswari & S.K. Maheswari, Financial Management, Vikas, 2012.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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18CE4241 – Disaster Management

(Open Elective – III)

B.Tech, IV Year, ECE, II Sem

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

Prerequisite(s): None.

Course objectives: Develop ability to

1. Gain knowledge on disasters and assess their impact.
2. Understand disaster management mechanisms.
3. Understand capacity building concepts and planning of disaster managements.
4. Assess various coping strategies during disasters.
5. Understand disaster management acts and policies in India.

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

CO1. Explain the basic concepts of disasters, hazards, risks and vulnerabilities.
CO2. Develop disaster management mechanisms to protect society.
CO3. Perform capacity assessment and explain legislative support at state and national levels.
CO4. Develop coping strategies at the time of disasters.
CO5. Prepare disaster risk reduction and management plans.

UNIT–I: Understanding Disaster - Concept of Disaster – Different approaches – Concept of Risk – Levels of Disasters – Disaster Phenomena and Events (Global, national and regional)
Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards – Characteristics and damage potential or natural hazards; hazard assessment – Dimensions of vulnerability factors; vulnerability assessment – Vulnerability and disaster risk – Vulnerabilities to flood and earthquake hazards.

UNIT–II: Disaster Management Mechanism - Concepts of risk management and crisis managements – Disaster Management Cycle – Response and Recovery – Development, Prevention, Mitigation and Preparedness – Planning for Relief

UNIT–III: Capacity Building - Concept – Structural and Non-structural measures – Capacity Assessment; Strengthening Capacity for Reducing Risk – Counter – Disaster Resources and their utility in Disaster Management – Legislative Support at the state and national levels

UNIT–IV: Coping with Disaster - Coping Strategies; alternative adjustment process – Changing concepts of disaster management – Industrial Safety Plan; Safety norms and survival kits – Mass media and disaster management.

UNIT–V: Planning for disaster management - Strategies for disaster management planning – Steps for formulating a disaster risk reduction plan – Disaster management Act and Policy in India – Organizational structure for disaster management in India- Preparation of state and district disaster management plans.

TEXT BOOKS:

1. Disaster Management, Dr. Mrinalini Pandey, Wiley India Pvt Ltd., 2014.
2. Disaster Science and Management, Tushar Bhattacharya, McGraw Hill Education, 2015.
3. Manual on Disaster Management in India, Ministry of Home Affairs, Government of India

https://www.undp.org/content/dam/india/docs/disaster_management_in_india.pdf

REFERENCE BOOKS:

1. Disaster Mitigation: Experiences and Reflections, PardeepSahni, PHI Learning, 2010.
2. Disaster Management Global Challenges and Local Solutions, Rajib, S and Krishna Murthy, R.R, Universities Press Hyderabad, 2012.
3. Earth and Atmospheric Disaster Management: Nature and Manmade,NavalePandharinath& C.K. Rajan, B.S. Publications, Hyderabad, 2009.
4. Manual on National Disaster Management Plan, National Disaster Management Authority, Ministry of Home affairs, Government of India
(http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf)

https://ndma.gov.in/images/pdf/NDMP-2018-Revised-Draft-1-2018OCT16-A.pdf

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18EE4242 – Micro-Electro-Mechanical Systems

(Open Elective – III)

B.Tech, IV Year, ECE, II Sem

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

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand semiconductors and solid mechanics used to fabricate MEMS devices.
2. Understand basics of Micro fabrication techniques.
3. Understand various sensors and actuators
4. Understand different materials used for MEMS
5. Understand applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

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

CO1. Identify different types of semiconductor and solid mechanic materials that are used to fabricate MEMS devices.
CO2. Apply basic science, circuit theory, Electro-magnetic field theory, control theory in Micro fabrication techniques
CO3. Distinguish between different sensors and actuators
CO4. Distinguish between various processes involved in Micro machining
CO5. Apply the knowledge of MEMs to other advanced applications such as polymer and optical MEMs

UNIT-I: Basics - Intrinsic Characteristics of MEMS, Energy Domains and Transducers, Sensors and Actuators, Introduction to Micro fabrication, Silicon based MEMS processes, New Materials, Review of Electrical and Mechanical concepts in MEMS, Semiconductor devices, Stress and strain analysis, Flexural beam bending, Torsional deflection

UNIT-II: Sensors and Actuators-I - Electrostatic sensors, Parallel plate capacitors, Applications, Inter-digitated Finger capacitor, Comb drive devices, Micro Grippers, Micro Motors, Thermal Sensing and Actuation , Thermal expansion, Thermal couples, Thermal resistors, Thermal Bimorph, Applications, Magnetic Actuators, Micro-magnetic components, Actuation using Shape Memory Alloys

UNIT-III: Sensors and Actuators-II - Piezoresistive sensors, Piezoresistive sensor materials, Stress analysis of mechanical elements, Applications to Inertia, Pressure, Tactile and Flow sensors, Piezoelectric sensors and actuators, piezoelectric effects, piezoelectric materials, Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT –IV: Micromachining - Silicon Anisotropic Etching, Anisotrophic Wet Etching, Dry Etching of Silicon, Plasma Etching, Deep Reaction Ion Etching (DRIE), Isotropic Wet Etching, Gas Phase Etchants, Case studies, Basic surface micro machining processes, Structural and Sacrificial Materials, Acceleration of sacrificial Etch, Striction and Antistriction methods

UNIT –V: Polymer and Optical MEMS - Polymers in MEMS, Polimide, SU-8, Liquid Crystal Polymer (LCP), PDMS, PMMA, Parylene, Fluorocarbon, Application to Acceleration, Pressure, Flow and Tactile sensors, Optical MEMS, Lenses and Mirrors, Actuators for Active Optical MEMS.

TEXT BOOKS:

1. Chang Liu, "Foundations of MEMS", Pearson Education Inc., 2006.
2. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

REFERENCE BOOKS:

1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
2. Stephen D Senturia, "Microsystem Design", Springer Publication, 2000.
3. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2000
4. Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, "Micro Sensors MEMS and Smart Devices", John Wiley & Son LTD,2002
5. James J.Allen, "Micro Electro Mechanical System Design", CRC Press Publisher, 2010
6. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer 2012.

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18ME4243 - Principles of Automobile Engineering

(Open Elective-III)

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

B.Tech, IV Year, ECE, II Sem

Pre-requisites: None

Course Objectives: Develop ability to

1. Introduction to Engineering analysis of the automobiles and their sub systems.
2. Applications of engineering principles to automotive design.
3. Improves ability to understand the different types of engines and automobile bodies.
4. Familiarization with the automotive industry and its terminology.
5. Develops an idea of utilization of resources duly reducing emission levels for achieving eco-friendly environment.

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

- **CO1:** Demonstrate the basic lay-out of an automobile.
- **CO2:** Distinguish between SI and CI engine's fuel system and cooling systems.
- **CO3:** Classify the principles of fuel ignition systems.
- **CO4:** Infer and select transmission system of an automobile
- **CO5:** Differentiate the steering systems

UNIT – I: Introduction: History of Automobiles, Classification of Automobiles. Chassis and body building, Engine Terminology, Classification of Engines

UNIT-II: Fuel System: spark Ignition engines-Fuel tank, fuel filter, fuel pump, air cleaner/filter, carburetor types, injection of petrol engines. Compression Ignition engines, Fuel Injection System- air & solid injection system, Pressure charging of engines, super charging and turbo charging

Cooling System : Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System, Radiators, Cooling Fan - water pump, thermostat, evaporating cooling, pressure sealed cooling, antifreeze solutions.

UNIT-III: Ignition System: Function of an ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, Battery ignition system

UNIT-IV: Transmission System: Clutch principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, gear boxes, types. Propeller shaft, Hotch Kiss drive, Torque tube drive, universal joint, differential, live and dead axles, wheels and tyres.

Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder, tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

UNIT-V: Steering System: Types of steering mechanism, Ackerman steering mechanism, Davis steering mechanism.

Text Books:

1. Kirpal Singh, Automobile Engineering, Vol.1 and 2, Standard Publishers, New Delhi, 2003.
2. A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.

Reference books:

1. Automotive Engines / Srinivasan
2. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International
3. Automobile Engineering / William H Crouse
4. A Text Book Automobile Engineering–Manzoor,. Nawazish Mehdi & .Yosuf Ali, Frontline Publications.

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18CS4245 - Database Systems

(Open Elective III)

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

B.Tech, IV Year, ECE, II Sem

Prerequisites: None

Course Objectives: Develop ability to

1. Understand the basic concepts and the applications of database systems.
2. Master the basics of SQL and construct queries using SQL.
3. Apply relational database design principles.
4. Understands the basic issues of transaction processing and concurrency control.
5. Know the needs of database storage structures and access techniques.

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

CO1. Demonstrate the basic elements of a relational database management system.
CO2. Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
CO3. Apply normalization for the development of application software.
CO4. Implement Transaction and Query processing techniques for data storage and retrieval.
CO5. Implement data storage structures and access through special databases.

UNIT I: Introduction - Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators, History of Database Systems. Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

UNIT II: Relational Model - Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.
Relational Algebra: Express Preliminaries, Relational Algebra. Basic Structure of SQL Queries, Set Operations, Null Values, Additional Basic Operations, Aggregate Functions, Nested Sub Queries, Views, Joins.

UNIT III: Schema Refinement and Normal Forms - Introduction to Schema Refinement, Functional Dependencies. Normal Forms – INF, 2NF, 3NF, BCNF, Multi valued dependencies – 4NF, 5NF.

UNIT IV: Transaction Management - Transactions, Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation and consistency, Serializability.
Concurrency Control: Lock–Based Protocols, Multiple Granularity, deadlock handling Timestamp-Based Protocols, Validation-Based Protocols, Recovery Systems.

UNIT V: Indexing and Hashing: Basic Concepts, Ordered Indices, B+ Tree Index Files, B Tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

Special Databases: Data analysis, data mining, data warehousing, spatial and geographical, multimedia database, mobility and personal database, distributed information system. World Wide Web, OLAP

TEXT BOOK(S)

1. Database System Concepts, Abraham Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India) Private Limited , 6th edition.

REFERENCE BOOK(S)

1. Database Systems, 6th edition, R Elmasri, Shamkant B.Navathe, Pearson Education.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition.
4. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
5. Introduction to Database Systems, C. J. Date, Pearson Education.

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18MB4246 – Entrepreneurship

(Open Elective - III)

B.Tech, IV Year, ECE, II Sem

L	T	P/D	C
3	-	-	3

Pre requisites: None

Course Objectives: Develop ability to

1. Understand the mindset of the entrepreneurs.
2. Analyze the financial aspects of establishing an enterprise.
3. Learn entrepreneurial activities and determine strategies for launching.
4. Identify the challenges of entrepreneurship and develop an idea on the entrepreneurial framework.
5. Apply strategic perspectives in entrepreneurship.

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

CO1: Explore and identify the entrepreneurial traits.
CO2: Identify various funding agencies and role of IPR.
CO3: Imagine and identify opportunities to launch new ventures.
CO4: Address entrepreneurial challenges.
CO5: Develop strategies for bringing stability and growth in business.

UNIT-I: Introduction to entrepreneurship - meaning, importance, entrepreneurship characteristics, women entrepreneurs, classifications of entrepreneurs, myths of entrepreneurship, qualities of entrepreneurship, competencies, attitude function and nature of forms of entrepreneurship.

UNIT-II: Promotion and financial aspects of entrepreneurship - Idea generation-opportunities- SWOT analysis, patents and trademark, intellectual property rights, source of capital, debt capital, seed capital, venture capital- informal agencies in financing entrepreneurs. Government grants and subsidies, types of investors and private offerings.

UNIT-III: Launching entrepreneurial ventures - opportunities identification- entrepreneurial imagination and creativities – the nature of the creativity process innovation and entrepreneurial- methods to initiate venture creating, new ventures-acquiring and established entrepreneurial venture, franchising hybrid-disadvantage of franchising.

UNIT-IV: Legal challenges of entrepreneurship - Intellectual property protection patents, copy rights-trademarks and trade secret. Avoiding pitfalls-formulation of the entrepreneurial plan-the challenges of new venture startups-poor financial understanding-critical factors for new venture development, the evaluation process, feasibility criteria approach.

UNIT-V: Strategic perspectives in entrepreneurship - Strategic planning-strategic actions-strategic positioning-business stabilization-building the adoptive firms-understanding the growth stage unique managerial concern of growing ventures.

Text Books

1. D F Kuratko and T V Rao "Entrepreneurship- A South - Asian Perspective "Cengage Learning, 1/e, 2012.
2. Vasanth Desai "Small Scale industries and entrepreneurship" Himalaya Publishing 2012.

Reference Books

1. B. Janakiram and M. Rizwana "Entrepreneurship Development: Text & Cases, Excel Books, 2011.
2. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
3. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013.

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18EC4201 – Global Navigation Satellite Systems

(Professional Elective - VI)

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

B.Tech, IV Year, ECE, II Sem

Prerequisite(s): 18EC3205 - Satellite Communications

Course Objectives: Develop ability to

1. Understand the necessity of deployment of various GNS systems, architecture and signal structure.
2. Understand the GNSS satellite orbit, measurements and various errors affecting systems performance.
3. Understand hardware and signal processing aspects of GNSS receiver design.
4. Understand basic principle of satellite based positioning and mathematical models for position estimation.
5. Understand the GNSS data handling and processing techniques.

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

1. Explain the various GNS systems, architecture and signal structure.
2. Explain satellite orbit determination, measurements and various errors affecting GNSS.
3. Explain the basic concepts of GNSS, signal processing and receiver design.
4. Explain principle of satellite based positioning and mathematical models for point positioning, precise point positioning and differential positioning.
5. Explain the GNSS data processing techniques and quality parameters used to judge the system performance.

UNIT – I: GNSS System

GPS, GLONASS and Galileo – Historical Review, Segments, Time system and Coordinate System and Signal Structure, Regional Systems – IRNSS, Beidou-1 and QZSS, Space Based Augmentation Systems – GAGAN, EGNOS, MSAS and WAAS.

UNIT – II: GNSS Fundamentals

Orbit description- Keplerian motion, Orbit Dissemination – Tracking networks and Ephemerides, Code Pseudoranges, Phase Pseudoranges, Biases and Noise, Atmospheric Effects, Relativistic Effects, Antenna phase center offset and Multipath

UNIT – III: GNSS Receiver Design

Receiver Design – Basic concept and Signal-to-Noise Ratio, Radio Frequency Front-end – Antenna Design, Reference Oscillator, Radio section, Channel Multiplexing, Acquisition and Tracking, Tracking Loops, Codeless Receivers and Navigation Processor.

UNIT – IV: Mathematical Models for GNSS Positioning

Satellite Based Positioning, Positioning and Navigating with satellites – Position determination, Velocity determination, Mathematical models for positioning – Point positioning, Precise Point Positioning and Differential Positioning.

UNIT – V: GNSS Data Processing

Data handling, Cycle slip Detection and Correction, Ambiguity Resolution – General aspects, Dual-frequency phase data and Combining dual-frequency carrier phase and code data, search

Techniques – A Standard Approach, Diltuion of Precision, Quality parameters – Accuracy, Availability, Continuity, Integrity, Reliability and Risk.

TEXT BOOKS:

1. Hofmann-Wellenhof, Lichtenegger and Wasle " Global Navigation Satellite Systems: GPS, Glonass, Galileo and more", Springer-Verlag Wien, 2008.
2. Hofmann-Wellenhof, Lichtenegger and Collins, "GPS Theory and Practice", 5th edition, Springer-Verlag Wien New York 2001

REFERENCE BOOKS:

1. Pratap Misra and Per Enge, "Global Positioning System Signals, Measurement, and Performance," Ganga- Jamuna Press, 2/e, Massachusetts, 2010.
2. Elliot D Kaplan and Christopher J Hegarty, "Understanding GPS principles and applications", Artech House Publishers, 2/e Boston & London 2005.

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18EC4202 - Digital Image and Video Processing

(Professional Elective - VI)

B.Tech, IV Year, ECE, II Sem

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

Prerequisite(s): 18EC3201-Digital Signal processing

Course Objectives: Develop ability to

1. Understand fundamentals of digital image processing , image transforms and image segmentation techniques.
2. Understand various image enhancement techniques in spatial and frequency domains.
3. Understand various image compression algorithms.
4. Understand the representation of video signal formation models.
5. Understand the principles and methods of motion estimation.

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

CO1: Apply various methods of acquiring and representing a digital image, various transforms and Image segmentation.
CO2: Apply various intensity based image processing techniques to enhance quality of image.
CO3: Explain various image compression algorithms for a given image.
CO4: Apply various formation models for video.
CO5: Apply different estimation methods for video motion.

UNIT-I: Digital Image Fundamentals & Image Transforms

Fundamental Steps in Digital Image Processing, Image Sampling and Quantization, Relationships between Pixels, 2-D DFT and its Properties, introduction to Discrete Cosine Transform, Hadamard, Walsh and K L Transform.

Image Segmentation Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT –II: Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, Linear and Non — Linear Gray Level Transformation, Local or Neighborhood Operation, Median Filter, Spatial Domain High-Pass Filtering.

Filtering in the Frequency Domain: Frequency Domain Filtering Fundamentals, Correspondence between Filtering in the Spatial and Frequency Domains, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.

UNIT III: Image Compression: Fundamentals, Fidelity Criteria, Image Compression Models, Coding Redundancy ,Some Basic Compression Methods, Huffman Coding, Arithmetic Coding, LZW Coding Run-Length Coding, Bit-Plane Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Block Transform Coding, JPEG .

UNIT IV : **Basic Steps of Video Processing**

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, filtering operations in cameras and display devices.

UNIT – V: 2-D Motion Estimation

Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Application of motion estimation in Video coding.

Waveform based video coding: Block based transform coding, Predictive coding.

TEXT BOOKS

1. Gonzaleze and Woods, "Digital Image Processing", 3rd Edition, Pearson
2. Yao Wang, Joem Ostermann and Ya–quin Zhang, "Video Processing and Communication",1st Edition, PH Int.

REFERENCE BOOKS

1. Gonzaleze and Woods, "Digital Image Processing using MATLAB", 2nd Edition, McGraw Hill Education, 2010
2. Digital Video Processing – M. Tekalp, Prentice Hall International
3. S. Jayaraman, S. Esakkirajan, T. Veera Kumar, "Digital Image Processing", TMH, 2009

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18EC4203- Low Power VLSI

(Professional Elective - VI)

B.Tech, IV Year, ECE, II Sem

L	T	P	C
3	-	-	3

Prerequisite(s): 18EC3202 - VLSI Design

Course Objectives: Develop ability to

1. Understand sources of power dissipation in CMOS VLSI Design.
2. Understand the techniques for low power VLSI design.
3. Understand different low voltage low power adder architectures.
4. Understand various low voltage low power multipliers.
5. Understand low voltage low power memory design techniques.

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

1. Explain sources of power dissipation and need for low power VLSI design.
2. Analyze the techniques for low power VLSI design.
3. Analyze performance of different low voltage low power adder architectures.
4. Analyze various low voltage low power multipliers.
5. Analyze low voltage low power memory design techniques.

UNIT – I: Low-Power CMOS VLSI Design - Introduction, Sources of Power Dissipation, Static Power Dissipation: Transistor Leakage Mechanisms, Channel Engineering for Leakage Reduction; Active Power Dissipation: Short Circuit Dissipation and Switching Dissipation.

UNIT – II: Circuit Techniques for Low Power Design - Introduction, Designing for Low Power, Circuit Techniques for Leakage Power Reduction – Multiple threshold voltage techniques, Architecture driven Voltage Scaling: Parallel and Pipelined Implementation.
Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT – III: Low-Voltage Low-Power Adders - Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Performance Evaluation of various adder architectures

UNIT – IV: Low-Voltage Low-Power Multipliers - Introduction, Overview of Multiplication, Types of Multiplier Architectures: Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier; Introduction to Wallace Tree Multiplier.

UNIT – V: Low-Voltage Low-Power Memory Design Techniques - Basics of ROM, SRAM and DRAM; Low Power ROM, SRAM and DRAM Technologies; Future trends in development of ROMs, SRAM and DRAM

Text Books:

1. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.
2. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.

Reference Books:

1. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.
2. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.

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18CS4207 – Data Analytics

(Professional Elective - VI)

B.Tech, IV Year, ECE, II Sem

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

Pre-requisites: 18EC2202 - Probability Theory and Stochastic Processes

Course Objectives: Develop ability to

1. Know the basic elements of Big Data and Data science to handle huge amount of data.
2. Gain knowledge of basic mathematics behind the Big data.
3. Understand the different Big data processing technologies.
4. Apply the Analytical concepts of Big data using R and Python.
5. Visualize the Big Data using different tools.

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

CO1: Observe Big Data elements and Architectures.
CO2: Apply different mathematical models for Big Data.
CO3: Demonstrate their Big Data skills by developing different applications.
CO4: Apply each learning model for different datasets.
CO5: Analyze needs, challenges and techniques for big data visualization.

UNIT I: Introduction: Data Science and Big Data

Introduction to Data science and Big Data, Defining Data science and Big Data, Big Data examples, Data explosion, Data volume, Data Velocity, Big data infrastructure and challenges, Big Data Processing Architectures, Data Warehouse.

UNIT II: Summarizing Data & Revisiting Probability

Summary Statistics-Summarizing data with R, Probability, Expected, Random, Bivariate Random variables, Probability distribution. Central Limit Theorem, Regression Analysis, Regression Modeling.

UNIT III: Big Data processing

Big Data technologies, Introduction to Google file system, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map Reduce tasks, Job, Task trackers, Introduction to NOSQL, Textual ETL processing.

UNIT IV: Big Data analytics

Data analytics life cycle, Data cleaning , Data transformation, Comparing reporting and analysis, Types of analysis, Analytical approaches, Data analytics using R, Exploring basic features of R, Exploring R GUI, Reading data sets, Manipulating and processing data in R, Functions and packages in R, Performing graphical analysis.

UNIT – V: Big Data Visualization

Introduction to Data visualization, Challenges to Big data visualization, Types of data visualization, Visualizing Big Data, Tools used in data visualization, Proprietary Data Visualization tools, Open source data visualization tools, Data visualization with Tableau.

TEXT BOOK(S)

1. Data warehousing in the age of Big Data, Krish Krishnan, Elsevier, ISBN: 9780124058910, 1st Edition. (Units I,III)(40%)
2. Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Mitzenmacher and Upfal, Cambridge University press, ISBN:521835402 hardback. (Units II)(20%)
3. Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition. (UNITS III,IV,V)(40%)

REFERENCES BOOK(S)

1. Algorithmic and Analysis Techniques in Property Testing, Dana Ron, School of EE.
2. Synopses for Massive Data: Samples, Histograms, Wavelets, Sketches, Foundation and trends in databases, Graham Cormode, Minos Garofalakis, Peter J. Haas and Chris Jermaine.
3. R for Business Analytics, A.Ohri, Springer, ISBN:978-1-4614-4343-8.
4. Hadoop in practice, Alex Holmes, Dreamtech press, ISBN:9781617292224.

18EC4204 – TECHNICAL SEMINAR

B.Tech, IV Year, ECE, II Sem

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

Pre-requisites: None

18EC4205 – PROJECT

B.Tech, IV Year, ECE, II Sem

L	T	P/D	C
-	-	20/-	10

Pre-requisites: None

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