ACADEMIC REGULATIONS, COURSE STRUCTURE, AND DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

For

B.Tech.FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2020-2021)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC- AUTONOMOUS)

Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTUH

Accredited by NAAC with 'A' Grade. Accredited by NBA

(Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097)

College

Vision:

Imparting Knowledge and instilling skills to the aspiring students in the field of Engineering, Technology, Science and Management to face the emerging challenges of the society.

Mission:

- Encouraging scholarly activities that transfer knowledge in the areas of Engineering, Technology, Science and Management.
- Ensuring students of all levels, well trained to meet the needs of education and their future endeavors.
- Inculcating human values and ethics into the education system for the all-round development of the students.

Department

About Department:

The Electronics and Communication Engineering Department was established in year 2005. The Department started with under graduate programmes in Electronics and Communication Engineering and later added Post Graduate programmes with specialization in VLSI system Design.It aims to deepen the knowledge and skills of the students on the basic concepts and theories that will equip them in their professional work involving analysis, systems implementation, operation, production, and maintenance of the various applications in the field of Electronics and Communications Engineering.The department has a blend of experienced and well qualified faculty having obtained Masters and Ph.D. degrees from premier institutes and have distinction of working with established national and international research organization.

Vision:

To be a centre of learning in the field of Electronics and Communication Engineering to develop competent professionals for industry and to fulfill the needs of the society.

Mission:

- To impart quality education through effective teaching learning process.
- To provide essential inter-disciplinary technology to make the students readily employable.
- To inculcate entrepreneurial skills to provide socially relevant and sustainable solutions.

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1.0 Under-Graduate Degree Program in Engineering & Technology (UGP in E & T)

Teegala Krishna Reddy Engineering College (TKREC) offers a VIII- Semesters (4-years) Bachelor of Technology (B.Tech.) degree Program, under the Choice Based Credit System (CBCS) with effect from the academic year 2020- 21 in the various branches of Engineering.

2.0 Eligibility for Admission

2.1 Seats for each Program in the college are classified into CATEGORY-A (70% of intake), CATEGORY-B (30% of intake) and CATEGORY-C (10% of intake through Lateral Entry in III semester).

2.2 Admission to the CATEGORY-A (70% of Intake) is made either on the basis of the merit rank obtained by the qualified candidate in the entrance test conducted by the Telangana State Government (EAMCET) or on the basis of any other order of merit approved by the Talangana State council for Higher Education, subject to reservations prescribed by the government from time to time.

2.3 The college fills CATEGORY-B (30% of Intake) as per the guidelines of the competent authority.

2.4 CATEGORY-C (10% of intake) are Lateral Entry students who are admitted into the third semester directly based on the rank secured by the candidate in the Engineering Common Entrance Test (ECET) in accordance with the instructions received from the convener, ECET and the competent authority.

2.5 The medium of instruction for the entire under graduate Program in E & T will only be in English.

2.6 It is mandatory that every student follows the undertaking and abides by the rules of Teegala Krishna Reddy Engineering College.

3.0 B. Tech. Program structure

3.1 A student after securing admission is required to pursue the under graduate Program in B.Tech for a minimum period of eight semesters, (four academic years) and a maximum period of eight academic years starting from the date of commencement of the first semester, failing which the student shall forfeit the seat in the B.Tech course.

Each student should secure 160 credits (with CGPA ≥ 5.0) for the completion of Undergraduate Program and award of B.Tech. Degree.

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. The student shall register for 123 credits and secure 123 credits with CGPA ≥ 5 from II year to IV year B.Tech program (LES) for the award of B.Tech. degree. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech (LES).

3.2 Definitions/descriptions specified by UGC/AICTE are adopted appropriately for various terms and abbreviations used in these academic regulations/norms are listed below.

3.2.1 **Semester scheme**

Each under graduate program constitutes eight semesters (four academic years). Each academic year is divided into two semesters, maximum of 22 weeks and minimum of 18 weeks (≥ 90 instructional days) each. In each semester, students are subjected to "Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE)". The Choice Based Semester System (CBSS) is implemented as prescribed by the UGC and the curriculum/course structure is followed as suggested by AICTE on time to time.

3.2.2 **Credit Courses**

All subjects/courses are to be registered by the student in a semester to earn credits which are assigned to each subject/course in an L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits) structure which is on the following general pattern.

- One credit for one Period/hour per week per semester for theory/lecture (L) courses.
- Half credit for one Period/hour per week per semester for laboratory/practical (P).

Courses like Environmental Science, Professional Ethics, Gender Sensitization lab, other social context courses, CRT and student activities like NCC/NSO, NSS are identified as mandatory courses. These courses do not carry any credits.

3.2.3 The structure of the Under Graduate Engineering Program:

S.NO.	CATEGORY	Suggested breakup of credits (Total 160)
01	Humanities and Social sciences including Management	9*
02	Basic Sciences	25*
03	Engineering Sciences courses including Workshop, Drawing,basics of Electrical/Mechanical/Computer etc.	18*
04	Professional Core Courses	66*
05	Professional Elective Courses relevant to chosenspecialization/branch	18*
06	Open Electives-Electives from other technical and/oremerging subjects	9*
07	Project work, Seminar and Internship in Industry orelsewhere	15*
08	Mandatory courses [Environmental Sciences, Induction Training, Indian Constitution, Essence of Indian Traditional Knowledge]	(non- credit)
	Total	**160***

***Variation is allowed as per the need of the respective disciplines.**

3.2.4 Subject Code Classification

The subject codes of various branches in TKREC Regulations are formulated using the following Procedure

Regulation, Branch, Semester, Classification, S.No.

Regulation	**20,21, 22, …., and so on**
UG Branch	**Corresponding branch code like CE,EE …..etc**
Semester	**I,II,III,IV,V,VI,VII,VIII**
Classification	**HS-Humanities and Sciences, BS-Basic Sciences,ES-Engineering Sciences, PC- Professional Core,PE-Professional Elective, OE-Open Elective, PW-Project Work**
S.No.	**1 to 9**

4.0 Course registration

4.1 An adviser /counselor or mentor from the faculty shall be assigned to a group of 20 students, who instructs the students regarding the Under Graduate Program, its course structure and curriculum, choice/option for subjects/courses, which is based on their competence, progress, pre-requisites and interest.

4.2 The academic section of the college invites 'registration forms' from students before the commencement of the semester through 'on-line registration' ensuring 'date and time stamping'. The on-line registration requests for any 'current semester' shall be completed before the commencement of the SEEs (Semester End Examinations) of the 'preceding semester', and for 1st semester students the online registration requests shall be completed four weeks from the date of admission.

4.3 A student can apply for on-line registration, only after obtaining the written approval from the faculty adviser/counselor or mentor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, faculty advisor/counselor or mentor and the student.

4.4 A student should register for all the courses offered to him in that particular semester not exceeding nine subjects/courses, excluding the Mandatory Courses.

4.5 If the student submits ambiguous choices or multiple options during on-line registration for the subject /course under a given/specified course group/category as listed in the course structure, then the Head of the Department will allot a subject/course without considering the submission.

4.6 Subject/course options exercised through on-line registration are final and cannot be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/course that has already been listed for registration by the Head of the Department in a semester cannot be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to select an alternate choice either for a new subject (subject to offering of such subject), or another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and within a time-framed schedule, in the first week after commencement of the class-work for that semester.

4.7 Open electives: The students have to choose three/four open electives (OE-I), (OE-II) (OE- III), (OE-IV) depending upon the curriculum. The student cannot opt for open elective subjects offered by their own (parent) department. The student can choose an open elective subject from the list of subjects offered by any other department of the same college. Once, a subject is chosen under the open elective category it cannot be opted again.

4.8 Professional electives: Students have to choose six professional electives (PE-I, PE-II, PE-III, PE-IV, PE-V, PE-VI). However, the students may opt for professional elective subjects offered in the related area.

5.0 Subjects/courses to be offered

5.1 The class strength for each semester shall be 60.

5.2 A subject/ course may be offered to the students, only if a minimum of 20 students (1/3 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60+ 1/3 of the

strength of the section).

5.3 More than one faculty member may offer the same subject (lab/practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice by the students will be based on – 'first come first serve basis and the CGPA criterion' (i.e. the primary shall be on on-line entry from the student for registration in that semester, and the focus that follows, if needed, will be on the CGPA of the student)

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

5.5 An Elective Course is offered to the students if and only if there is a minimum of 1/3 strength of the sanctioned intake registers for that course.

6.0 Attendance requirements

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate in all the subjects/courses including days of internal examinations (excluding attendance in mandatory courses like Environmental Science, Professional Ethics, Gender Sensitization Lab, NCC and NSS, subjects related to social context and CRT) for that semester.

6.2 For Mandatory Courses a 'Satisfactory Participation' report shall be issued to those students from the authorities concerned only after securing ≥ 65% attendance in such a course.

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 grounds, like natural calamity, medical emergency, any sudden demise of close family members based on the students representation with supporting evidence/certificates.

6.4 A stipulated fee shall be paid to condone the 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 a semester, are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall be cancelled. They will not be promoted to the next semester.

6.7 The students who are detained due to lack of attendance should seek re-admission into that semester as and when offered, and re-register all the courses offered in that semester.

6.8 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class, until completion of the VIII semester, even on payment of the requisite fees.

7.0 Academic requirements

The following academic requirements have to be satisfied; in addition to the attendance, requirements mentioned in item no 6.

7.1 A student shall be deemed to have satisfied the minimum academic requirements if he/she has earned the credits allotted to each subject/course, and has secured not less than 35% marks (26 out of 75) 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 'C' grade or above in that subject/course

7.2 Promotion Rules:

S.No.	Promotion	Conditions to be fulfilled
1.	**I Semester to II Semester**	**Regular course of study of I semester bysatisfying attendance requirements.**

2.	**II Semester to III Semester**	**Regular course of study of II Semester, by satisfying attendance requirements. Must have secured at least 50% credits up to from the offered credits from all the relevant regular and supplementaryexaminations, whether the student takes those examinations or not.**
3.	**III Semester to IV Semester**	**Regular course of study of III semester, bysatisfying attendance requirements.**
4.	**IV Semester to V Semester**	**Regular course of study of IV semester, bysatisfying attendance requirements, andmust have secured at least credits i.e., 60%credits up to IV semester from the offeredcredits (rounding to near low value) from all the relevant regular and supplementary examinations, whether the students takes those examinations or not**
5.	**V Semester to VI Semester**	**Regular course of study of V Semester, bySatisfying attendance requirements.**
6	**VI Semester to VII Semester**	**Regular course study of VI semester, by satisfying attendance requirements. Must have secured at least 60% credits (rounding to near lower value) up to VI Semester from the offeredcredits from all the relevant regular andsupplementary examinations, whether the student takes those examinations or not.**
7	**VII Semester to VIII Semester**	**Regular course of study of VII Semester, bysatisfying attendance requirements.**

Promotion Rules for Lateral Entry Students

S.No.	Promotion	Conditions to be fulfilled
01	**III Semester to IV Semester**	**Regular course of study of Second Year first semester, by satisfying attendance requirements.**
02	**IV Semester to V Semester**	**Regular course of study of IV Semester by satisfying attendance requirements and a minimum of 50 % of credits (rounding to thenear lower value) from the offered credits, from one regular and one supplementary examinations of III semester, irrespective of the candidate takes the examination or not.**
03	**V Semester to VI Semester**	**Regular course of study of V Semester bysatisfying attendance requirements.**
04	**VI semester to VII Semester**	**Regular course of study of VI Semester bysatisfying academic requirements and aminimum of 60% of credits (rounding to thenear low value) from the offered credits,from two regular and two supplementaryexaminations of III Semester; two regularand one supplementary examinations of IV Semester; one regular and one Supplementary examination of V Semester.**
05	**VII Semester to VIII Semester**	**Regular course of study of VII semester bysatisfying the academic requirements.**

7.3 A student shall register for subjects covering 160 credits as specified and listed in the course

structure, fulfill all the attendance and academic requirements for 160 credits, 'earn all 160 credits' by securing SGPA ≥ 5.0 (in each semester) and CGPA (at the end of each successive semester ≥ 5.0) to successfully complete the Under Graduate Program.

7.4 A student eligible to appear in the end semester examination for any subject/course, but absent from it or failed (there by failing to secure 'c' grade or above) may reappear for that subject/course in the supplementary examination as and when conducted. In such cases, the CIE assessed earlier for that subject/course will be carried over, and added to the marks to be obtained in the SEE Supplementary examination for evaluating the performance in that subject.

7.5 A student **detained in a semester due to shortage of attendance, may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements.** The academic regulations under which the student has been readmitted shall be applicable. However, no grade allotments or SGPA/CGPA calculations will be done for the entire semester in which the student has been detained.

7.6 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits.** The academic regulations under which the student has been re-admitted shall be applicable to him.

8.0 Evaluation – Distribution and Weightage of marks

8.1 The performance of a student in every subject/course (including Practical) will be evaluated for 100 marks each, with 25 marks allotted for CIE (Continuous Internal Evaluation) and 75 marks for SEE (Semester End Examination).

8.2 For theory subjects, during a semester there shall be two mid-term examinations and average of two internal examinations will be taken as the final marks for CIE. Each mid-term examination consists of only descriptive paper carrying 20 marks with the time duration of 1hour 20 minutes. The remaining 5 marks will be evaluated by the assignment given by the concerned faculty. The syllabus for the first mid examination shall be first 2.5 units. The second mid examination covers remaining 2.5 units of syllabus. **The total marks secured by the student for the whole CIE (Continuous Internal Evaluation) will be the average of two mid-terms.** If any student is absent from / would like to seek improvement in any subject of a mid- term examination, a computer based test will be conducted for him/her by the examination branch of the college, which will be scheduled after completion of both mid-term examinations.

The details of CIE exam question paper are as follows

- ❖ The pattern of Mid-term exam for CIE consists of 4 questions and no choice will be given.
- ❖ Each question carries 5 marks.
- ❖ There will be a CBT (Computer Based Test) for the students who are absent and secured less than 14 marks in the continuous internal evaluation. The CBT will be conducted before the announcement of the results of semester-end exams.
- ❖ The question bank for the CBT should cover entire syllabus of the corresponding course.

The details of the pattern of the end semester question paper are as follows

- ➢ The end semester examinations will be conducted for 75 marks.
- ➢ The question paper consists of two parts namely Part- A and Part-B.
- ➢ Part-A consists of 10 questions. Each question carries 2.5 marks each and no choice will be given. Two questions are from one unit and all the five units should be covered.
- ➢ Part-B consists of five questions (number from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub questions. For each question, there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

The details of evaluation of end semester exam are as follows

- Double evaluation of the answer scripts is followed.
- The average of the two evaluations shall be considered as final marks.
- If the difference of two valuations is more than or equal to15 marks, third evaluation shall be recommended.
- If any difference appeared in the marks after the third valuation also, average of two evaluations will be considered whose difference is minimum, as final marks.

The details of challenging valuation of end semester exam are as follows

- There shall not be any recounting or re-evaluation for all subjects as the double valuation was adopted. But, the students will be given a chance to apply for challenging valuation for all the theory Subjects (no Practical/lab subjects) within one week from the date of declaration of results.
- Whenever the students apply for challenge valuation of answer scripts of semester end examinations, the students should submit their applications (through the HOD) within one week from the date of declaration of the results to the Examination Branch by paying Rs.10,000 (Rupees Ten Thousand only) per subject, in the form of Demand Draft, Drawn in Favor of "TKREC AUTONOMOUS". Any application received after the due date of submission for Challenge valuation, shall not be accepted under any circumstances.

On receipt of the DD

The answer script of the applied subject will be shown to the candidate to verify whether it belongs to him or not and the script will be evaluated by the senior faculty of the college appointed by the Controller of examinations. If there is any change in marks (Equal or above 15% of the maximum marks) the new marks will be awarded to the student. Otherwise, there will be no change in old marks. If the change in marks (Equal or above 15% of the maximum marks) occurs, an amount of Rs.9,000/- will be refunded to the student. Otherwise, the student will forfeit the total amount which he/she paid.

8.3 For practical subjects there shall be a continuous internal evaluation during the semester for 25 marks and 75 marks for end semester practical examinations. The duration for both Internal and External Practical Examination is 3 hours. For 25 marks of Internal Evaluation of practical subjects, day-to-day evaluation in laboratory is done for 15 marks and internal practical examination will be assessed for 10 marks. The concerned laboratory subject teacher (Internal Examiner) will conduct the internal practical examination only. The external practical examination will have 2 examiners, one is the external examiner and the other is the internal examiner. The controller of examinations of the college will appoint the external examiner with the consultation of the chief superintendent of examinations from the three names given by the concerned department.

8.4 For the subjects that include design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing and estimation), the distribution shall be 25 marks for continuous internal evaluation (15 marks for day-to-day evaluation and 10 marks for internal examination) and 75 marks for semester end examination. **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**.

8.5 (i) For subjects like **Engineering Graphics/ Engineering Drawing**, the SEE shall consist of five questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

(ii) For the Subject **Estimation, Costing and Project Management**, the SEE paper should consist of Part- A, Part-B and Part C. (i) Part – A, 1 out of 2 questions from Unit – I for 30 Marks, (ii) Part – B, 1 out of 2 questions from Unit – II for 15 Marks,(iii) Part – C, 3 out of 5 questions from Units – III, IV, V for 30 Marks.

(iii) For subjects **Structural Engineering – I & II (RCC & STEEL),** the SEE will be conducted for 75 marks consisting of 2 parts viz. (i) Part – A for 15 marks and, (i) Part – B for 60 marks. Part

– A is a compulsory question consisting of ten sub- questions. The first five sub-questions are from each unit relating to design theory and codal provisions and carry 2 marks each. The next five sub-questions are from each unit and carry 1 mark each. Part – B consists of 5 questions (numbered 2 to 6).

8.6 The student has to undergo a comprehensive MCQ TEST/ Seminar/Internship/industry oriented mini project/Project Work offered to him by their respective departments and subsequently should satisfy the requirements for completion to acquire the required credits.

8.7 There shall be an Internship in collaboration with an industry of their specialization. Students will register for this immediately after II year II semester examinations and pursue it during summer vacation for 15 days. The Internship shall be submitted in a report form and presented before the committee in III year I semester. It shall be evaluated for 100 internal marks. The committee consists of Head of the Department, supervisor of the Internship and a senior faculty member of the department.

8.8 There shall be an Industrial Oriented Mini Project in collaboration with an industry of their specialization. Students will register for this immediately after III year II semester examinations and pursue it during summer vacation for one month. Industrial Oriented Mini Project shall be submitted in a report form and presented before the committee in IV year I semester. It shall be evaluated for 100 external marks. The committee consists of an external examiner, Head of the Department, supervisor of the Industrial Oriented mini project and a senior faculty member of the department. There shall be no internal marks for Industrial Oriented Mini Project.

8.9 There shall be a seminar presentation in IV year I semester. For the seminar, the student shall collect the information on a specialized topic, prepare a technical report, and submit it to the department. It shall be evaluated by the departmental committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 100 internal marks. There shall be no semester end examination for the seminar.

8.10 There shall be a comprehensive MCQ exam in IV year I semester. For the comprehensive MCQ exam covers the core subjects which are related to Graduate Aptitude Test in Engineering. It shall be evaluated by the departmental coordinator nominated by Head of the Department. The comprehensive MCQ exam shall be evaluated for 100 internal marks and consists of 50 MCQs. The student has to secure 40% of 100 marks i.e.40 marks. If any student is absent or failed in the comprehensive MCQ exam then he/she can appear for next supplementary exam like other end semester examinations.

8.11 UG project work shall be carried out in two stages: Project Stage – I during IV Year I Semester, Project Stage – II during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report includes project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.

(i) For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work for 75 marks and project supervisor shall evaluate for 25 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one re-appearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

(ii) For Project Stage – II, the external examiner shall evaluate the project work for 75 marks and the project supervisor shall evaluate it for 25 marks. The topics for industrial oriented mini project, seminar and Project Stage – I shall be different from one another. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum '

total of the CIE and SEE taken together. For conducting viva-voce of project stage – II, the controller of examination will nominate an external examiner with the consultation of the chief superintendent from the list of experts in the relevant branch submitted by the concerned department. A student who has failed may re-appear once for the above evaluation in the current semester, when it is scheduled again; if student fails in such 'one re-appearance' evaluation also, he/she has to reappear for the same in the next subsequent semester, as and when it is scheduled.

(iii) Procedure for opting the MOOCs

- If any student got an opportunity to do the final year project as an internship in any reputed company (Approved by the departmental committee), the student can opt for MOOCs which are equivalent to the elective courses offered in VIII semester.
- The MOOCs should be approved by the concerned BOS.
- The selected MOOCs duration should be minimum of 12 weeks.
- A student is eligible to secure up to 12 credits only through MOOCs.

8.12 The laboratory marks, sessional marks, and the end examination marks awarded by the college are subject to scrutiny and scaling, if necessary, by a committee, constituted in this regard, with a university representative/under the guidance of the Director of Evaluation of the affiliating university. The recommendations of the committee are final and binding. The laboratory records, internal examination scripts and external examination scripts, shall be preserved as per the rules for two consecutive academic years if the respective subjects are cleared, and shall be produced before the committee as and when required, till preserved.

8.13 For mandatory courses related to Environmental Science, Constitution of India, Intellectual Property Rights, Gender Sensitization lab and Campus recruitment training 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 subject/course. **These marks should also be uploaded along with the internal marks of other subjects**

8.14 For all non-credit courses and mandatory courses, no marks or letter grade is allotted.

9.0 Grading Procedure

9.1 Marks will be awarded to the student to indicate the performance in each theory subject, laboratory/ practical's, seminar, project stage I and project stage II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item no. 8 above, a corresponding letter grade shall be given.

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

% of marks secured in a subject/course	Letter Grade	GradePoints
90% to 100%	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

**** Awarding of Letter Grade will be done for the benefit of the student.**

9.3 A student obtaining '**F**' grade in any subject shall be deemed to have **'failed'** and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In

such cases, internal marks in those subjects will remain same as those obtained earlier.

9.4 A student who has not appeared for an examination in any subject '**Ab'** grade will be allocated in that subject, and the student shall be considered as **'failed'.** The student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered.

9.5 A letter grade will not indicate any specific percentage of marks, but states only the range of marks he/she has obtained.

9.6 A student earns Grade Point (GP) in each subject/course, based on the Grade Point the letter grade is awarded for that subject/course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/course.

Credit points (CP) = grade points (GP) x Credits for a course

9.7 The student passes the subject/course only when **GP ≥ 5 ('C' grade or above).**

9.8 The semester grade point average (SGPA) is calculated by dividing the sum of credit points (∑CP) secured from all subjects/course registered in a semester, by the total number of credits registered during the semester. SGPA is rounded off to two decimal places. SGPA is thus calculated as

SGPA = {∑*N*i=1*CiGi*}/ {∑*N* *Ci*} ….. For each semester,

where 'i' is the subject indicator index (takes into account all subjects, in a semester), 'N' is the no. of subjects registered for the semester (as specifically required and listed under the course structure of the parent department), Ci is the no. of credits allotted to the ith subject, and Gi represents the grade points (GP) corresponding to the letter grade awarded for the ith subject.

9.9 The cumulative grade point average (CGPA) is a measure of the overall cumulative performance of a student in **all semesters** considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

CGPA = {∑Mj=1*CjGj*}/ {∑Mj=1 C j for all semester registered}

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total no. of subjects** (as specifically required and listed under the course structure of the parent department) the student has '**registered**' i.e., from 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), cj is the no. of credits allotted to the jth subject, and Gj represents the grade point (GP) corresponding to the letter grade awarded for that jth subject. After registration and completion of first year first semester, the SGPA of that semester itself can be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/subject	Credits	Grade points	Letter Grade	Credit Points
Course1	3	8	A	3 x 8 = 24
Course2	3	10	O	3 x 10 = 30
Course3	3	5	C	3 x 5 = 15
Course4	3	6	B	3 x 6 = 18
Course5	3	9	A+	3 x 9 = 27
Course6	1.5	7	B+	1.5x 7 = 10.5
	16.5			**124.5**

SGPA = 124.5/16.5 = 7.55

Illustration of calculation of CGPA up to 2nd Semester

Course/subject	Credits	LetterGrade	Gradepoints	Credit Points
I year I semester				
Course1	4	A	8	4 x 8 = 32
Course2	4	O	10	4 x 10 = 40
Course3	4	C	5	4 x 5 = 20
Course4	3	B	6	3 x 6 = 18
Course5	3	A+	9	3 x 9 = 27
Course6	3	B+	7	3 x 7 = 21
I year II semester				
Course7	4	B	6	4 x 7 = 28
Course8	4	O	10	4 x 10 = 40
Course9	4	C	5	4 x 5 = 20
Course10	3	B	6	3 x 6 = 18
Course11	3	A+	9	3 x 9 = 27
Course12	1.5	B+	7	1.5 x 7 = 10.5
Total Credits =	**40.5**		**Total Credit=**	**301.5**

CGPA = 301.5/40.5 = 7.44

The above illustrated calculation process of CGPA will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th 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 CGPAs will be used.

9.11 For calculations listed in regulations 9.6 to 9.9, performance in failed subjects/courses (securing **F grade**) will also be taken into account, and the credits of such subjects/courses will be included in the multiplications and summations. After passing the failed subjects (s), newly secured grade points will be taken into account for calculation of SGPA and CGPA. However, mandatory courses will not be taken into consideration for calculation of CGPA and SGPA.

10.0 Passing standards

10.1 A student shall be declared successful or 'passed' in a semester, if the student secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when student gets an SGPA ≥ 5.00 at the end of that particular semester); also a student shall be declared successful or 'passed' in the entire under graduate Program, only when he/she gets a CGPA ≥ 5.00 for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (Course code, title, no. of credits, and grade earned etc.), credits earned, SGPA, and CGPA.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of marks = (CGPA-0.5) x 10

12 Award of degree

12.1 A student who registers for all the specified subjects/courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of the B.Tech degree in the chosen branch of Engineering as selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 Students with the final CGPA (at the end of the under graduate Program) ≥ 8.00, and fulfilling the following condition will be awarded **'first class with distinction'; should have secured a final (at the end of the undergraduate Program) CGPA ≥ 8.00,** for each year of course study.
Students with final CGPA (at the end of the under graduate Program) ≥ **6.50 but <8.00**, shall be placed in '**first class'**.
Students with final CGPA (at the end of the under graduate Program) ≥ **5.50 but<6.50**, shall be placed in '**second class'**.
Students with final CGPA (at the end of the under graduate Program) ≥ **5.00 but <5.50,** and all other students who qualify for the award of degree (as per 12.1) with final CGPA ≥ **5.00 but <5.50**, shall be placed in **'pass class'**.
A student with final CGPA (at the end of the under graduate Program) **<5.00, will not be eligible** for the award of the degree**.**

12.4 Student who secures SGPA ≥ 8.00 consistently in all semesters will be eligible to compete for the awards of 'rank' and 'gold medal'.

13 Withholding of results

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

14.0 Transitory Regulations

14.1 A student, who has discontinued for any reason, is liable to completely pay his balance annual fees, up to discontinued year.

14.2 A student who is detained due to lack of credits or lack of attendance has to follow the existing regulations of the year in which he/she is re-admitted, with additional/substitute subjects if necessary.

15.0 Students Transfers

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

15.2 There shall be no transfers from one branch to another branch within the constituent colleges and units of the affiliating university (JNTUH).

15.3 The students seeking transfer under the ceiling admission category to this college from any of the JNTUH affiliated Autonomous colleges or from various other Universities/institutions (National Importance, Autonomous) have to pass the failed subjects which are equivalent to the subjects of Teegala Krishna Reddy Engineering College and also pass the subjects of Teegala Krishna Reddy Engineering College which the students have not studied at the earlier institution/university. Further, though the students have passed some of the subjects at the earlier institution/university, if the same subjects are being offered in different semesters of Teegala Krishna Reddy Engineering College, the students have to study those subjects in Teegala Krishna Reddy Engineering College

in spite of the fact that those subjects are repeated.

15.4 The students transferred from other Universities/institutions to Teegala Krishna Reddy Engineering College, shall be provided a chance of writing online internal examination **for the failed subjects/and or subjects not studied** as per the equivalences recommended in the clearance letter issued by the university/institution, at the end of the semester as per the prescribed schedule by the college examination cell.

16.0 Scope

16.1 The academic regulations should be read as whole, for the purpose of any interpretation.

16.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Governing Body of Teegala Krishna Reddy Engineering College is final.

16.3 The college may change or amend the academic regulations, course structure or syllabi, at any time, and the changes or amendments made shall be applicable to all students with effect from the date of notification by the college authorities.

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	**Punishment**
	If the Student	
1. (a)	Possesses or carries accessible in the 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 subject of the examination (theory or practical) in which he is appearing but has not made use of (materialshall include any marks on the body of the candidate which can be used as an aid in thesubject of the examination)	Expulsion fromthe examination hall and cancellationof the performance in that subject only.
(b)	Gives assistance or guidance or receives it fromany other candidate orally or byany other bodylanguage methods or communicates through cell phones with any candidate or persons in oroutside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellationof the performance in that subject only of all the candidates involved. In case of an outsider, he will behanded 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 subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellationof the performance in that subject and all other subjects the candidate has already appeared includingpractical examinations and project work and shall notbe permitted to appear for the remaining examinationsof the subjects of that Semester. The hall ticket of the candidate should be cancelled.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from the 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 subjects of the examination (including practical and project work) already appeared and shall not be allowed to appear for

		examinations of the remaining subjects of that semester. The student is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat. If the imposteris an outsider, he will be handed over to the police and a case will be 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 cancellationof performance in that subject and all the other subjects the candidate has already appeared includingpractical examinations and project work and shall notbe permitted for the remaining examinations of the subjects of that semester. The student is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the student is subject to the academicregulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters tothe examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
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 tohis person or to any of his relations whether	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shallnot be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are

		debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case will be registered against them.
	by words, either spoken or written or by signsor 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 thetendency to disrupt the orderly conduct of the examination	
7.	Leaves the exam hall taking away answerscript 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 inthat subject and all the other subjectsthe candidate has already appeared including practicalexaminations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all end examinations. The continuation of thecourse by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation ofthe performance inthat subject and all other subjectsthe 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. The candidate is also debarred and forfeits the seat.

9.	Indulges in any malpractice or improperconduct mentioned in clause 6 to 8 and is not a student for the particular examination or not a person connected with the college.	Student of the college expulsion from the examinationhall and cancellation ofthe Performance inthat subject and all other subjects 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. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation ofthe performance inthat subject and all other subjectsthe 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.
11.	Is detected copying on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and allother subjects the candidate has appeared including practical examinations and project work of that semester examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall bereported to the PRINCIPAL / DIRECTOR forfurther action to award suitable punishment.	

I Year B.Tech. ECE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20MA1BS01	BS	Mathematics – I	3	1	0	4
02	20CS1BS02	BS	Programming For Problem Solving	3	1	0	4
03	20ME1ES02	ES	Engineering Graphics	1	0	4	3
04	20AP1BS02	BS	Applied Physics	3	1	0	4
05	20CS1ES03	ES	Programming For Problem Solving Lab	0	0	3	1.5
06	20AP1BS03	BS	Applied Physics Lab	0	0	3	1.5
07	20MC1ES04	ES	Environmental Science	3	0	0	0
	Total			**13**	**3**	**10**	**18**

I Year B.Tech. ECE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20MA2BS04	BS	Mathematics - II	3	1	0	4
02	20CH2BS05	BS	Chemistry	3	1	0	4
03	20EE2ES05	ES	Basic Electrical Engineering	3	0	0	3
04	20EN2HS01	HS	English	2	0	0	2
05	20ME2ES06	ES	Engineering Workshop	1	0	3	2.5
06	20CH2BS06	BS	Engineering Chemistry Lab	0	0	3	1.5
07	20EN2HS02	HS	English Language and Communication skillsLab	0	0	2	1
08	20EE2ES07	ES	Basic Electrical Engineering Lab	0	0	2	1
	Total			**12**	**2**	**10**	**19**

II Year B.Tech. ECE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20EC3PC01	PC	Electronic Devices and Circuits	3	1	0	4
02	20EC3PC02	PC	Network Analysis and Transmission Lines	3	0	0	3
03	20EC3PC03	PC	Switching Theory and Logic Design	3	1	0	4
04	20EC3PC04	PC	Signals and Systems	3	1	0	4
05	20EC3ES08	ES	Probability Theory and Stochastic Processes	3	0	0	3
06	20EC3PC05	PC	Electronic Devices and Circuits Lab	0	0	3	1
07	20EC3PC06	PC	Switching Theory and Logic Design Lab	0	0	3	1
08	20EC3ES09	ES	Basic simulation lab	0	0	2	1
09	20MC3HS01	HS	Professional Engineering Ethics	3	0	0	0
10	20MC3BS02	BS	Quantitative Analysis-I	3	0	0	0

	Total	**21**	**3**	**6**	**21**

II Year B.Tech. ECE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20EC4PC07	PC	Analog and Digital Communications	3	1	0	4
02	20EC4PC08	PC	Electromagnetic Fields and Waves	3	0	0	3
03	20EC4PC09	PC	Analog and Pulse Circuits	3	0	0	3
04	20MA4BS07	BS	Numerical Methods &Complex Variables	3	1	0	4
05	20EC4PC10	PC	Linear IC Applications	3	0	0	3
06	20EC4PC11	PC	Analog And Digital Communications Lab	0	0	3	1.5
07	20EC4PC12	PC	Analog and Pulse Circuits Lab	0	0	3	1.5
08	20EC4PC13	PC	IC Applications Lab	0	0	2	1
09	20MC4HS03	HS	Gender Sensitization Lab	3	0	0	0
10	20MC4BS03	BS	Quantitative Logical and Reasoning	3	0	0	0
	Total			**21**	**2**	**8**	**21**

III Year B.Tech. ECE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20MS5HS03	HS	Business Economics & Financial Analysis	3	0	0	3
02	20EC5PC14	PC	Antenna and Wave Propagation	3	1	0	4
03	20EC5PC15	PC	Computer Networks	3	0	0	3
04	20EC5PC16	PC	Microprocessors & Microcontrollers	3	1	0	4
05			Professional Elective – I	3	0	0	3
06	20EC5PC17	PC	Computer Networks Lab	0	0	2	1
07	20EC5PC18	PC	Microprocessors & Microcontrollers Lab	0	0	3	1.5
08	20EN5HS04	HS	Advanced Communication Skills Lab	0	0	2	1
09	20MC5HS05	HS	Intellectual Property Rights	3	0	0	0
10	20MC5HS06	HS	Personality Development and Soft Skills	2	0	0	0
11	20EC5PW01	PW	Summer Internship	0	0	0	1
	Total			**20**	**2**	**8**	**21.5**

Professional Elective – I

S. No	Subject Code	Subject Name
1	20EC5PE11	Computer Organization and Operating Systems
2	20EC5PE12	Electronic Measurements and Instrumentation
3	20EC5PE13	Data Analytics

III Year B.Tech. ECE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1	20EC6PC19	PC	Control Systems	3	1	0	4
2	20EC6PC20	PC	Digital Signal Processing	3	1	0	4
3	20EC6PC21	PC	VLSI Design	3	1	0	4
4			Professional Elective – II	3	0	0	3
5			Open Elective – I	3	0	0	3
6	0EC6PC22	PC	Digital Signal Processing Lab	0	0	3	1.5
7	20EC6PC23	PC	e – CAD Lab	0	0	3	1.5
8	20 EC6PC24	PC	Python Programming Lab	0	0	3	1.5
9	20MC6CS01	CS	Basic Technical Training	3	0	0	0
	Total			**18**	**3**	**8**	**22.5**

Professional Elective – II

S. No	Subject Code	Subject Name
1	20EC6PE21	Cellular and Mobile Communications
2	20EC6PE22	Embedded System Design
3	20EC6PE23	Information Theory and Coding

Open Elective–I

S. No	Subject Code	Subject Name
01	20EC6OE11	Principles of Electronic Communications

*** Open Elective subjects' syllabus is provided at the end of the document.**
*** Open Elective – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.**

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

IV Year B.Tech. ECE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1	20EC7PC25	PC	Microwave Engineering	3	0	0	3
2			Professional Elective – III	3	0	0	3
3			Professional Elective – IV	3	0	0	3
4			Open Elective – II	3	0	0	3
5	20SM7MS02	MS	Fundamentals Of Management for Engineers	2	0	0	2
6	20EC7PC26	PC	Microwave Engineering Lab	0	0	2	1
7	20EC7PW02	PW	Industrial Oriented Mini Project/ SummerInternship	0	0	0	2
8	20EC7PC27	PC	Comprehensive Exam	0	0	0	1
9	20EC7PC28	PC	Seminar	0	0	2	1
10	20EC8PW03	PW	Project Stage – I	0	0	6	3
	Total			**14**	**0**	**10**	**22**

Professional Elective – III

S. No	Subject Code	Subject Name
1	20EC7PE31	Digital Image Processing
2	20EC7PE32	Wireless Sensor Networks
3	20EC7PE33	Neural Networks & Applications

Professional Elective – IV

S. No	Subject Code	Subject Name
1	20EC7PE41	Satellite Communications
2	20EC7PE42	Speech Processing
3	20EC7PE43	Bio-Medical Electronics

Open Elective–II

S. No	Subject Code	Subject Name
1	20EC7OE21	Fundamentals of signal processing

*** Open Elective subjects' syllabus is provided at the end of the document.**

*** Open Elective – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.**

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

IV Year B.Tech. ECE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1			Professional Elective – V	3	0	0	3
2			Professional Elective – VI	3	0	0	3
3			Open Elective – III	3	0	0	3
4	20EC8PW04		Project Stage – II	0	0	14	7
	Total			**9**	**0**	**14**	**16**

Professional Elective – V

S. No	Subject Code	Subject Name
1	20EC8PE51	IoT and its Applications
2	20EC8PE52	Network Security and Cryptography
3	20EC8PE53	Radar Systems

Professional Elective – VI

S. No	Subject Code	Subject Name
1	20EC8PE61	Optical Communications
2	20EC8PE62	Artificial Intelligence
3	20EC8PE63	Global Positioning System

Open Elective–III

S. No	Subject Code	Subject Name
1	20EC8OE31	Electronic Measuring Instruments

*** Open Elective subjects' syllabus is provided at the end of the document.**

*** Open Elective – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.**

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE - I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20MA1BS01) MATHEMATICS – I

Course Objectives: To learn.

1 Types of matrices and their properties.
2 Concept of a rank of the matrix and applying this concept to know the consistency and solving the System of linear equations.
3 Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
4 Concept of Sequence.
5 Concept of nature of the series.
6 Geometrical approach to the mean value theorems and their application to the mathematical Problems.
7 Evaluation of surface areas and volumes of revolutions of curves.
8 Evaluation of improper integrals using Beta and Gamma functions.
9 Partial differentiation, concept of total derivative.
10 Finding maxima and minima of function of two and three variables.

Course outcomes: After learning the contents of this paper the student must be able to

1. Write the matrix form of a set of linear equations and to analyse the solution of the System of equations.
2. Reduce the quadratic form to canonical form.
3. Describe the nature of sequence and series.
4. Apply the mean value theorems.
5. Calculate the extreme values of functions of two variables with / without constraints

UNIT-I

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, Gauss Seidel Iteration Method.

UNIT-II

Eigen values and Eigen vectors: Linear Transformation and Orthogonal Transformation. Eigen values 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

Sequences &Series: Sequence: Definition of a Sequence, limit, and Convergent, **Divergent and Oscillatory sequences. Series:** Convergent, Divergent and Oscillatory Series, Series of positive terms. Comparison test, p-test, D-Alembert's ratio test, Raabe's test, Cauchy's Integral test, Cauchy's root test, logarithmic test. **Alternating series**: Leibnitz test; **Alternating Convergent series**: Absolute and Conditional Convergence.

UNIT-IV

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

UNIT-V

Multivariable calculus: 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.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G. B. Thomas and R.L Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE - I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20CS1ES01) PROGRAMMING FOR PROBLEM SOLVING

Course Objectives: To learn.

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems

Course outcomes: The student able to

1. Build the algorithm for the given unsolved problems.
2. Apply the concepts of arrays, strings, structures and pointers to find the solution for the given problem
3. Apply the various preprocessor commands in a given different real time situations.
4. Dissect a problem into sub functions to develop modular reusable code.
5. Demonstrate various searching, sorting techniques along with the complex city analysis

UNIT-I

Introduction to Programming Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems, **Introduction** to **Algorithms:** steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming, Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments, **Bitwise operations:** Bitwise AND, OR, XOR and NOT operators, **Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, go to, Iteration with for, while, do- while loops, **I/O:** Simple input and output with scan of and print of, formatted I/O, Introduction to stdin, std out and stderr, Command line arguments.

UNIT-II

Arrays, Strings, Structures and Pointers: **Arrays**: one- and two-dimensional arrays, creating, accessing and manipulating, elements of arrays. **Strings**: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.

Structures: Defining structures, initializing structures, unions, Array of structures.

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type.

UNIT-III

Preprocessor and File handling in C: Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef. **Files**: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT-IV

Function and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries, **Recursion**: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions. **Dynamic memory allocation**: Allocating and freeing memory, Allocating memory for arrays of different data types.

UNIT-V

Introduction to Algorithms: Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number, etc. **Basic searching in an array of elements** (linear and binary search techniques), **Basic algorithms to sort array of elements** (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

TEXTBOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, how to solve it by Computer, Pearson (16th Impression).
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE - I Sem	**L**	**T**	**P**	**C**
	1	**0**	**4**	**3**

(20ME1ES02) ENGINEERING GRAPHICS

Course Objectives: To learn.

1. To provide basic concepts in engineering drawing**.**
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw sectional views and pictorial views of solids.

Course outcomes: The student able to

1. Apply the principles of Engineering Graphics to create Engineering Drawings of various geometric constructions, conic sections, curves and scales asper BIS standards
2. Construct orthographic projections for points, lines and planes in different quadrants and Auxiliary views.
3. Draw the sectional views and true shape of sections of solids, by applying principles of projections.
4. Draw the development of surfaces and inter sections of solids in real time situation
5. Develop isometric and orthographic views of the objects

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 &Diagonal.

UNIT-II

ORTHOGRAPHICPROJECTIONS: Principles of Orthographic Projections–Conventions– Projections of Points and Lines, Projections of Plane regular geometric figures. —Auxiliary Planes.

UNIT-III

PROJECTION SOFREGULARSOLIDS–AuxiliaryViews-SectionsorSectionalviewsofRightRegular Solids–Prism, Cylinder, Pyramid, Cone–Auxiliary views–Sections of Sphere.

UNIT-IV

DEVELOPMENT OF SURFACES OF RIGHTREGULARSOLIDS–Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of –Prism vs Prism- Cylinder Vs Cylinder.

UNIT-V

ISOMETRIC PROJECTIONS: Principles of Isometric Projection – Isometric Scale – Isometric Views–Conventions–Isometric Views of Lines, Plane Figures, Simple and Compound Solids– Isometric Projectionofobjectshavingnonisometriclines.IsometricProjectionofSphericalParts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions.

INTRODUCTION TO CAD: (For Internal Evaluation Weightage only): Introduction to CADS of tware Package Commands. -FreeHandSketchesof2DCreationof 2DSketchesbyCADPackage.

TEXTBOOKS:

1. Engineering Drawing. Bhatt/Charotar
2. Engineering Drawing/ N.S. Parthasarathy and Vela Murali/Oxford

REFERENCE BOOKS:

1. Engineering Drawing/ Basant Agrawal and McAgrawal/McGrawHill
2. Engineering Drawing/ M.B.Shah,B.C.Rane/ Pearson.
3. Computer Aided Engineering Drawing–K Balaveera Reddy etal–CBS Publishers

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE - I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20AP1BS02) APPLIED PHYSICS

Course Objectives: To learn.

1. Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
2. Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
3. The graduates will be able to solve non-traditional problems that potentially draw on knowledge e in multiple are as o physics.
4. To study applications in engineering like memory devices, transformer coriander cryomagnetic machinery.

Course outcomes: After learning the content sof the syllabus, the student

Demonstrate the fundamentals concepts of modern physics and quantum mechanics.

1. Design various electronic circuits using fundamentals of Semiconductor physics.
2. Design various electronic circuits using fundamentals of Semiconductor physics
3. Apply the concepts of optoelectronics in various op to electronic devices
4. Apply the learned knowledge of laser and fiberoptics in communication systems.
5. Analyse various magnetic and electromagnetic properties applicable in magnetic materials

Unit-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation- Definition, Reflections inside blackbody, blackbody radiation spectrum Planck's law - derivation of Planck's radiation law in terms of wavelength Photoelectric effect-Experimental arrangement, Characteristics of photo electron, Einstein's photo electric equation Compton effect-Definition, theory, derivation for recoil of electron in Compton effect de-Broglie's hypothesis-properties of matter waves, equation for de-Broglie wavelength, different expressions associated to de-Broglie wavelength, Wave-particle duality-wave particle duality in matter waves, Davisson and Germer's experiment-Construction, theory of Davisson and Germer's Heisenberg's Uncertainty principle-statement onlyborn's interpretation-physical significance of wave function, normalized condition Schrodinger's time independent wave equation-Derivation, Particle in one dimensional box-boundary conditions, expression for energy of particle, normalized condition

Unit-II: Semiconductor Physics

Semiconductors Dependence of Fermi level on carrier-concentration and temperature- for intrinsic and extrinsic semiconductors, Carrier generation and recombination-formation of depletion region, diffusion and drift Hall effect- Definition, experimental setup, determination of hall voltage and hall coefficient, applications-N junction diode-construction, working-I Characteristics and their applications Zener diode-construction, working-I Characteristics, Zener diode as voltage regulator Bipolar Junction Transistor(BJT)-Construction and working of PNP and NPN transistors .

Unit-III: Optoelectronics

Introduction to Optoelectronic devices, Radiative and Non-Radiative recombination mechanisms in semiconductors LED - structure, working, characteristics and applications Semi-conductor laser: structure, working and characteristics of Homo and Hetro junction laser diode Photodetectors: device structure, working and characteristics of Solar cell, PIN diode and Avalanche photo diode.

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Unit-IV: Lasers and Fiber Optics

Expansion of Laser, **Interaction of radiation with matter-** stimulated absorption, spontaneous emission

and stimulated emission **Coherence-**definition only **Working principle of Laser** -Phenomenon of lasing action **Population inversion-**definition of population inversion, expressions for Einstein's coefficients **Pumping**-difference between three level and four level pumping schemes, different pumping methods used in lasers **Types of Lasers**: Construction, working principle and applications of **Ruby laser, Carbon dioxide (CO2) laser and He-Ne laser**.

Introduction to Fiber Optics-Total internal reflection, Optical fiber as a dielectric wave guide **Acceptance angle**- expression for acceptance angle and concept of acceptance cone in optical fiber **Numerical aperture-**expression for numerical aperture, **Step and Graded index fibers**-structure and characteristics of single mode step index, multimode step index fibers and graded index fibers **Losses associated with optical fibers-**absorption loss, scattering loss and bending loss, **Applications of optical fibers.**

Unit-V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics-definition of electric potential, electric current, scalar and vector field**s** **Continuity equation**-derivation **Maxwell's equations**-Gauss's law in electrostatics, Gauss's law in magneto statics, Ampere's and Faraday's laws(Integral and derivate forms)**Dielectric materials**-Polarization, Permittivity and Dielectric constant (**definitions only**), **Internal fields in a solid**- Definition of internal field, derivation for Internal field **Clausius-Mossotti equation**-derivation, **Ferroelectrics and Piezo electrics** – characteristics and applications **Magnetization**-Magnetic dipole, Intensity of magnetization, permeability and susceptibility (**definitions only**),**Classification of magnetic materials**-Characteristics of Día, Para, Ferro, Ferri and Anti-ferro magnetic materials **Ferromagnetism and ferromagnetic domains**- definition of ferro magnetism, variation of domains with external field **Hysteresis**- explanation of B-H curve **Applications of magnetic materials**

TEXTBOOKS:

1. Applied Physics, B.K.Pandey, S.Chaturvedi-Cengage Learning.
2. HallidayandResnickPhysics-Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S.Chand

REFERENCE BOOKS:

1. Richard Robinett, Quantum Mechanics
2. J.Singh, Semiconductor Optoelectronics: Physics &Technology, McGraw-Hillinc (1995).
3. Online Course: "Optoelectronic Materials and Devices" by MonicaKatiyar and Deepak Gupthaon NPTEL

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE - I Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20CS1ES03) PROGRAMMING FOR PROBLEM SOLVING LAB

Course Objectives The student will be able to:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To Analyse the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files**.**

Course outcomes: The student will be able to:

1. Formulate The Algorithms for Simple Problems.
2. Translate the given algorithms to C program.
3. Correct the logical errors found during program execution.
4. Make use of pointers in different types to modularize the code with functions.
5. Apply the appropriate sorting techniques for the given list of elements.

Practice sessions:

a Write a simple program that prints the results of all the operators available in C (including pre/ post increment, bitwise and/or/not, etc.). Read required operand values from standard input.

b Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

Simple numeric problems:

a Write a program for fiend the max and min from the three numbers.

b Write the program for the simple, compound interest.

c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

d Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

5 x 1 = 5

5 x 2 = 10

5 x 3 = 15

e Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s= ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).

b Write a C program, which takes two integer operands and one operator from the user, performs

the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

c Write a program that finds if a given number is a prime number

d Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

e 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.

f Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

g Write a C program to find the roots of a Quadratic equation.

h Write a C program to calculate the following, where x is a fractional value

1-x/2+x^2/4-x^3/6

i Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:
1+x+x^2+x^3+.....+x^n. For example: if n is 3 and x is 5, then the program compute 1+5+25+125.

Arrays and Pointers and Functions:

a Write a C program to find the minimum, maximum and average in an array of integers.

b Write a function to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.

c Write a C program that uses functions to perform the following:
i. Addition of Two Matrices
ii. Multiplication of Two Matrices
iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.

d Write C programs that use both recursive and non-recursive functions
i. To find the factorial of a given integer.
ii. To find the GCD (greatest common divisor) of two given integers.
iii. To find x^n

e Write a program for reading elements using pointer into array and display the values using array.

Files:

a Write a C program to display the contents of a file to standard output device.

b Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

c Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

d Write a C program that does the following:

It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function) The program should then read all 10 values and print them back.

e Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

b Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

c Write a C program that uses functions to perform the following operations:

d To insert a sub-string in to a given main string from a given position.

e To delete n Characters from a given position in a given string.

f Write a C program to determine if the given string is a palindrome or not (Spelled same in

g both directions with or without a meaning like madam, civic, noon, abcba, etc.)

h Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

i Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

a Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

b Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
1 2	* *	2 3	2 2	* *
1 2 3	* * *	4 5 6	3 3 3	* * *
			4 4 4 4	* *
				*

Sorting and Searching:

a Write a C program that uses non recursive function to search for a key value in a given list of integers using linear search method.

b Write a C program that uses non recursive function to search for a key value in a given sorted list of integers using binary search method.

c Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d Write a C program that sorts the given array of integers using selection sort in descending order

e Write a C program that sorts the given array of integers using insertion sort in ascending order

f Write a C program that sorts a given array of names.

Suggested Reference Books for solving the problems:

i Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

ii B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

iii Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice

iv Hall of India

v R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)

vi Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

vii Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE - I Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20AP1BS03) APPLIED PHYSICS LAB

Course outcomes: The student

1. Compute the (V-I/P-I) characteristics of LED, LASER, and Solar cell.
2. Calculate the energy gap of semiconductor diode.
3. Interpret the theory of Hall effect with experiment by determining the Hall coefficient.
4. Examine the bending losses for different Optical fiber Cables.
5. Construct various circuits –Resonance, Time constant and Magnetic field using LCR, RC, Stewart and Gees circuits

List of Experiments:

1. Energy gap of P-N junction diode:
   To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell
3. To study the V-I Characteristics of solar cell.
4. Stewart–Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Haplodeficient to forgiven semiconductor.
6. Photo electric effect: To determine work function of a given material.
7. LASER: To study the characteristics of LASER sources.
8. Optical fibre: To determine the bending losses of Optical fibres
9. LCR Circuit: To determine the Quality factor of LCR Circuit.
10. R-C Circuit: To determine the time constant of R-C circuit.

Note:Any 8 experiments are to be performed.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE - I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

(20MC1ES04) ENVIRONMENTAL SCIENCE

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures
3. Understanding the environmental policies and regulations

Course outcomes: The students should be able to

1. Explain the concept of ecological perspective and the value of the environment.
2. Value the significance of various natural resources and its management.
3. Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.
4. Identify different types of pollution and their control measures, effective methods of waste management with best possible solutions.
5. Develop an awareness about environmental laws and sustainable development.

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, Biomagnifications, ecosystem value, services and carrying capacity, 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. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies

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. India as a mega diversity nation, Hot spots of biodiversity. Field visit. 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, ambientair 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:** Waste water Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control

technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. 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, biomedical 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- economical 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.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard Twight. 2008 PHL LearningPrivate Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P.Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4thEdition, 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.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE – II Sem

L	T	P	C
3	1	0	4

(20MA2BS04) MATHEMATICS – II

Course Objectives: To learn.

1. Methods of solving the differential equations of first and higher order
2. Evaluation of multiple integrals and their applications
3. The physical quantities involved in engineering field related to vector valued functions.
4. The basic properties of vector valued functions and their applications to line, Surface and volume integrals

Course outcomes: After learning the contents of this the student must be able to

1. Determine different types of ordinary differential equations of first order.
2. Apply the concept of differential equation to real world problems.
3. Apply the concept of multiple integrals to find areas, volumes.
4. Evaluate the Centre of mass and gravity for cubes, sphere and rectangular parallelopiped
5. Calculate the line, surface and volume integrals and converting them from one to another.

Unit-I

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-II

Ordinary Differential Equations of Higher Order: Second order linear differential equations with constant coefficients. Non-Homogeneous terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $xV(x)$. Method of variation of parameters. Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

Unit-III

Multiple Integrals: 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), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelepiped).

Unit-IV

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.

Unit-V

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

TEXTBOOKS:

1. **B.S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. **Erwin kreyszig**, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
3. **G.B. Thomas and R.L. Finney**, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint

REFERENCE BOOKS:

1. **Paras Ram**, Engineering Mathematics, 2nd Edition, CBS Publishers.
2. **S. L. Ross**, Differential Equations, 3rd Ed., Wiley India, 1984.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20CH2BS05) CHEMISTRY

Course Objectives: To learn.

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
3. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
4. To acquire the skills pertaining to spectroscopy and to apply them for medical field etc.
5. To impart then knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

Course outcomes: At the end of the course, the students will be able to:

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular
2. Measure various parameters of water and its significance in industrial and domestic purpose.
3. Make use of essential aspects of Electro chemistry and Corrosion in industry.
4. Explain stereochemistry and synthetic aspects useful for understanding reaction pathways.
5. Apply the basic principles of various Spectroscopic techniques in chemical industry and medical field

Unit-1: **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 NO molecules. Bond order.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries. Factors affecting in magnitude of splitting. Magnetic and color properties.

Band structure of solids and effect of doping on conductance-doping, P-doping.

Unit-2: 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 ozonation. Boiler feed water –Boiler troubles Scale, Sludge, Priming, Foaming and Caustic embrittlement. Treatment. Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water. Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

Unit-3: Electrochemistry and corrosion Electrochemical 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 electro chemical corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings –Methods of coating- Hot dipping, cementation – Hot Dipping-Galvanization and Tinning. Electroless plating of copper.

Unit-4: Stereochemistry, Reaction Mechanism and synthesis of drug molecules Representation of 3-dimensional structures, Isomers-Structural and stereoisomers, Enantiomers, diastereomers, symmetry and chirality. Optical activity Absolute configuration. Conformational analysis of n- butane.
Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownik off and anti Markownik off's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkyl halides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and CrO_3.
Reduction reactions: Reduction of carbonyl compounds using $LiAlH_4$& $NaBH_4$.Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Unit-5: Spectroscopic techniques and applications:
Principles of electronic spectroscopy: Beer's Lamberts law, numerical problems. Types of electronic excitations. Applications of uv-visible spectroscopy. IR Spectroscopy: Principle, modes of vibrations, selection rules, Force constant, some common organic Functional groups wave no. regions (C-H, NH, OH, -COOH, C=0, C≡N, C=C and C≡C) Applications of IR Spectroscopy, H NMR (NMR Spectroscopy) Principle of NMR spectroscopy Chemical shift, chemical shifts of some common organic protons. Introduction to MRI.

TEXTBOOKS:

1. Text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing company (P)Ltd. New Delhi.

REFERENCE BOOKS:

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
3. University Chemistry, by B.H. Mahan
4. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
5. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5th Edition.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE2ES05) BASIC ELECTRICAL ENGINEERING

Course Objectives:

1. To introduce the basics of electrical circuits and its components
2. To understand DC circuits and AC single phase & three phase circuits.
3. To introduce the concept of power, power factor.
4. To study and understand the different types of magnetic circuits i.e. DC/AC machines and Transformers.
5. To import the knowledge of various electrical installations and power factor improvement methods.

Course outcomes:

1. Solve electrical circuits using basic network laws and theorems.
2. Apply the concept of AC Circuit parameters and its effect on resonance.
3. Explain the operation of Transformers and its applications.
4. Construct the DC and AC machines and its working principles
5. Interpret the components of LT Switchgear and 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 RL-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.

TEXTBOOKS:

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. J. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall, India, 1989.
4. Circuit Theory Analysis and Synthesis, Abhijit Chakrabarti, Dhanpat Rai& Co, 2016

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**2**

(20EN2HS01) ENGLISH

Course Objectives: The course will help to

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Equip students to study 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**.**

Course outcomes: At the end of the course, students will be able to

1. Use English Language effectively in spoken and written communication.
2. Comprehend the given texts and respond appropriately
3. Communicate confidently in various contexts and different cultures.
4. Demonstrate basic proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Improve language proficiency to meet their academic and professional needs

UNIT - I

The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes. 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 Clauses 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 textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: 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 E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

UNIT - III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge Uniersity Press.

Vocabulary: 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- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence

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UNIT - IV

What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary: 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 - 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: Technical Vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

TEXTBOOKS:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press

REFERENCE BOOKS:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.
7. Raju, Yadava B, B T Sujatha & C, Murali Krishna. English for Better Performance, Orient Black swan, Pvt.,Ltd, 2014

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I Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	1	**0**	**3**	**2.5**

(20ME2ES06) ENGINEERING WORKSHOP

Course Objectives: The objectives of this lab are.

1. To study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at workplace.
5. To explain the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. To identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

1. Apply different workshop trades like fitting, carpentry, foundry and welding.
2. Practice workshop trades like Tim smithy, Black smithy.
3. Apply suitable tools for different trades of engineering processes including drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.
5. Demonstrate various machines, tools and their operations.

TRADESFOREXERCISES:

At least two exercises from each trade:

Carpentry– (T-Lap Joint, Dovetail Joint, Mortise &Tenon Joint)

i Fitting– (V-Fit, Dovetail Fit &Semi-circular fit)
ii Tin-Smithy– (Square in, Rectangular Tray &Conical Funnel)
iii Foundry– (Preparation of Greens and Mould using Single Piece and Split Pattern)
iv Welding Practice– (Arc Welding &Gas Welding)
v House-wiring– (Parallel &Series, Two-way Switch and Tube Light)
vi Blacksmith– (Round to Square, Fan Hook and S-Hook)

TRADESFORDEMONSTRATION&EXPOSURE

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Workshop Manual-P.Kannaiah /K.L.Narayana/ SciTech
2. Workshop Manual/Venkat Reddy/ BSP

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20CH2BS06) ENGINEERING CHEMISTRY LAB

Course Objectives: The chemistry laboratory course consists of experiments related to the principles of chemistry required to the engineering student. The course will make the student to learn:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

Course outcomes: The experiments will make the student gain basic skills on:

1. An ability to Analyse the quality of water by determining its chemical parameters.
2. The synthesis of common drugs like Paracetamol and Aspirin
3. Determination of rate constant of a reaction from concentration – time relationships
4. Determination of physical properties like adsorption and viscosity of lubricants.
5. Estimation of different types of qualitative and quantitative measurements of a given

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Estimation of Fe^{+2} by Dichrometry.
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe^{2+} by Potentiometry using $KMnO_4$
7. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of R_f values. egortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of Coconut oil and ground nut oil by using Ostwald's viscometer.
13. Determination of surface tension of a give liquid using stalagmometer.
14. 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 5th edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

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I Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EN2HS02 ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Objectives: To learn

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students" pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize their mother tongue influence
5. To train students to use language appropriately for public speaking and interviews

Course outcomes: After the end of the course students will be able to

1. Employ the nuances of English language through audio-visual experience and group activities.
2. Articulate a neutral accent of English for intelligibility by overcoming mother tongue influence.
3. Develop the skill of using appropriate language in various speaking contexts.
4. Take part in oral presentations using formal language.
5. Improve speaking skills with clarity and confidence which in turn enhance their interpersonal skills

UNIT – I
Exercise – I
CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of 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 – Introducing Oneself and Others.

UNIT – II
Exercise – 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: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

UNIT – III
Exercise – III
CALL Lab:
Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.
ICS Lab:

Understand: How to make Formal Presentations.

UNIT – IV
CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks.
Practice: Making a Short Speech – Extempore

UNIT – V
Exercise – V
CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Interview Skills.
Practice: Mock Interviews.

TEXTBOOKS:

1. **ELCS Lab Manual**
   (The course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech. First English)

REFERENCE BOOKS:

1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
4. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Black swan. Hyderabad.
6. Hewing's, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP Marks, J. 2009. English Pronunciation in Use. Eleme
7. English Pronouncing Dictionary Daniel Jones Current Edition with CD.
8. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation

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I Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EE2ES07) BASIC ELECTRICAL ENGINEERING LAB

Course Objectives:

1. To Analyse and understand behavior given network by applying various electrical laws and network theorems
2. To know the response of electrical circuits for different excitations
3. To determine, measure and know the relation between basic electrical quantities.
4. To Analyse the performance characteristics of DC and AC electrical machines

Course outcomes:

1. Explain the basic electrical laws.
2. Produce the response in different types of electrical circuits to different excitations.
3. Analyse the response of electrical circuits under resonance condition.
4. Calculate the measuring parameters and relation between the basic electrical parameters
5. Evaluate the basic characteristics of transformers and electrical machines

List of experiments/demonstrations:

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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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC3PC01) ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of components.
3. To know the switching characteristics of components
4. To give understanding of various types of MOSFET

Course outcomes: Upon completion of the Course, the students will be able to

1. Apply the Characteristics of different Practical Diodes.
2. Choose PN Junction Diode as a Rectifier, Clippers, Clampers and Sampling Gates.
3. Analyse the Characteristics of Transistor Configurations and its Biasing.
4. Evaluate the Characteristics of JFET and its Biasing.
5. Design the MOSFET as an Inverter.

UNIT - I

Diode and Special Purpose Devices: Diode - Static and Dynamic resistances, Equivalentcircuit, Load line analysis, Diffusion and Transition Capacitances, Zener Diode – Characteristics, Zener as Voltage Regulator, Principle of Operation - SCR, Tunnel diode,UJT**,** Varactor Diode, LED, Semiconductor Photodiode.

UNIT - II

Applications of Diode: Diode as a Switch and its Switching times, Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers, Sampling Gates – Unidirectional and Bidirectional Sampling Gates, Four Diode Sampling Gate, Reduction of Pedestal in Gate Circuits.

UNIT - III

Bipolar Junction Transistor (BJT) and its Biasing: Principle of Operation, Transistor as an amplifier, Common Emitter, Common Base and Common Collector Configurations, Transistor Hybrid Model, Determination of H-Parameters from Transistor characteristics, Typical values of H-parameters in CE, CB, CC Configurations, Transistor as a switch, switching times, Low frequency response of BJT Amplifiers. Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self-Bias, Bias Stability, Bias Compensation using Diodes.

UNIT - IV

Junction Field Effect Transistor (FET) and its Biasing: Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, FET as Voltage Variable Resistor, Comparison of BJT and FET, FET Biasing - Fixed Bias, Self-Bias and voltageDivider Bias and Simple problems

UNIT - V

Metal Oxide Semiconductor Field Effect Transistor (MOSFET): Introduction, Construction, Principle of Operation and Characteristics in Enhancement and Depletion mode, MOSFET as an inverter, MOSFET as a Resistor, Principle of operation of BICMOS.

TEXTBOOKS:

1. Electronic Devices and Circuits- Jacob Millman, McGraw Hill Education
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th

REFERENCE BOOKS:

1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
3. Pulse, Digital and Switching Waveforms –J. Millman, H.Taub and Mothiki S.Prakash Rao, 2Ed., 2008, Mc Graw Hill.

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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC3PC02) NETWORK ANALYSIS AND TRANSMISSION LINES

Course Objectives:

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transient states in RLC circuits.
3. To understand the two port network parameters.
4. To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

Course outcomes: Upon successful completion of the course, students will be able to

1. Calculate transient and steady state responses of RLC circuits.
2. Relate two-port network parameters and attenuators.
3. Evaluate the transmission line parameters and characteristics.
4. Design transmission lines of various lengths using smith chart configuration.

UNIT - I

Network Topology, Basic cut set and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedancetransformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT - II

Transient and Steady state analysis of RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. Problem solving using R-L-C elements with DC excitation and AC excitation, RC Circuits as integrator and differentiators. 2 nd order series and parallel RLC Circuits, Quality factor and bandwidth for series and parallel resonance, resonance curves.

UNIT - III

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T, □, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT - IV

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.

UNIT - V

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. λ/4, λ/2, λ/8 Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

TEXTBOOKS:

1. Network Analysis – Van Valkenburg, 3rd Ed., Pearson, 2016.
2. 2.Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.

3. 3.Electric Circuits – J. Edminister and M. Nahvi – Schaum's Outlines, Mc Graw Hills Education, 1999.

REFERENCE BOOKS:

1. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 8th Edition,1993.
2. 2.Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC3PC03) SWITCHING THEORY AND LOGIC DESIGN

Course Objectives:

1. To understand common forms of number representation in logic circuits
2. To learn basic techniques for the design of digital circuits and fundamental concepts used inthe design of digital systems.
3. To understand the concepts of combinational logic circuits and sequential circuits

Course outcomes: Upon completion of the Course, the students will be able to:

1. Apply the concept of Boolean algebra to simplify SOP and POS Boolean functions
2. Construct combinational logical circuits using K-map method.
3. Differentiate Combinational and Sequential logical circuits.
4. Evaluate Synchronous and Asynchronous Sequential circuits
5. Design a Finite state machine using Moore and Mealy Machines.

UNIT – I

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT – II

Minimization of Boolean functions: Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method.

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

UNIT – III

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

UNIT - IV

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

UNIT – V

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits-Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N – Counters. Finite state machine-capabilities and limitations, Mealy and Moore models.

TEXTBOOKS:

1. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rd Edition,Cambridge, 2010

2. Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill

REFERENCE BOOKS:

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Introduction to Switching Theory and Logic Design – Fredric J. Hill, Gerald R.Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004

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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC3PC04) SIGNALS AND SYSTEMS

Course Objectives:

1. This gives the basics of Signals and Systems required for all Electrical Engineering related courses.
2. To understand the behavior of signal in time and frequency domain
3. To understand the characteristics of LTI systems
4. This gives concepts of Signals and Systems and its analysis using different transform techniques.

Course outcomes: Upon successful completion of the course, students will be able to

1. Apply the concept of orthogonality on signals and systems.
2. Demonstrate the concepts of Fourier series and Fourier Transform techniques for given specifications.
3. Analyse system characteristics for given specifications.
4. Estimate ROC and stability conditions of S and Z domains for given conditions.
5. Design a given system using concept of sampling theorem and correlation.

Unit-I

Signal Analysis: Definition of Signals and Systems, Classification of Signals, Elementary Operations on Signals, Classification of Systems, Analogy between Vectors and Signals, Orthogonal Signal Space,Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions.

Unit-II

Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Wave symmetry, Gibbs phenomenon, Complex Fourier spectrum.

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 Transform, and Introduction to Hilbert Transform.

Unit-III

Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

Unit-IV

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, and Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms. Representation of stability of a system using Laplace and Z-Transforms.

Unit-V

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

Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

TEXTBOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed

REFERENCE BOOKS:

1. Signals and Systems – Simon Haskin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE.
5. Signals and Systems – K. Deergha Rao, Birkhauser, 2018

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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC3ES08) PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Objectives:

1. This gives basic understanding of random signals and processing
2. Utilization of Random signals and systems in Communications and Signal Processing areas.
3. To know the Spectral and temporal characteristics of Random Process.
4. To Learn the Basic concepts of Noise sources

Course outcomes: Upon successful completion of the course, students will be able to

1. Apply the concepts of probability and random variable to find probability density function.
2. Use the concepts of operations of random variable on given single and multiple random variables.
3. Analyse the concepts of temporal characteristics of a random process.
4. Evaluate the spectral density of a given random process.
5. Design a noise free communication system by implementing the concepts of linear system responses & SNR.

Unit-I: Probability & Random Variable: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, Random Variable- Definition, Conditions fora Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

Unit-II: Operations on Single & Multiple Random Variables – Expectations: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non- monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable. Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence.
Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function.

Unit-III: Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationary and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationary, (N-Order) and Strict-Sense Stationary, 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, Poisson Random Process.

Unit-IV: 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 Processes: Response of linear systems to random signals:

System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output. Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

Noise sources: Classification of Noises, Resistive/Thermal Noise Sources, Arbitrary Noise Sources, Effective Noise Temperature, Signal to noise ratio, Available power gain, Equivalent noise bandwidth, Equivalent input noise temperature, Noise figure, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TEXTBOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH),2008.

REFERENCE BOOKS:

1. Random Processes for Engineers-Bruce Hajck, Cambridge unipress,2015.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002
3. Probability, Statistics & Random Processes-K. Murugesan, P. Guruswamy, Anuradha Agencies3rd Edition, 2003.
4. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2003.
5. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1**

(20EC3PC05) ELECTRONIC DEVICES AND CIRCUITS LAB

Course Objectives:

1. To impart the knowledge of various configurations, characteristics and applications of various electronic devices.
2. Acquires the knowledge of various biasing circuits of Transistor.
3. To study frequency response amplifier

Course outcomes: Upon successful completion of the course, students will be able to:

1. Apply the Characteristics of various Practical Diodes.
2. Connect PN Junction Diode to form a Rectifier and Filter circuits
3. Test different types of Clippers and Clampers using PN Junction Diodes.
4. Develop circuits to verify characteristics of Transistor configurations.
5. Evaluate the characteristics of JFET.

List of Experiments (Twelve experiments to be done):

1. Verify any twelve experiments in H/W Laboratory
   PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. PN Junction diode characteristics A) Forward bias B) Reverse bias.
3. Zener diode characteristics and Zener as voltage Regulator.
4. Half Wave Rectifier with & without filters.
5. Full Wave Rectifier with & without filters.
6. Input and output characteristics of BJT in CE Configuration
7. Input and output characteristics of FET in CS Configuration
8. Measurement of h-parameters of transistor in CB, CE, CC configurations
9. Frequency Response of Common Emitter Amplifier
10. Frequency Response of Common Source Amplifier
11. Switching characteristics of a transistor
12. SCR Characteristics.
13. UJT as a Relaxation Oscillator.
14. Types of Clippers at different reference voltages

Major Equipment required for Laboratories:

1. **Regulated Power Supply, 0-30V**
2. 20 MHz, Dual Channel Cathode Ray Oscilloscope.
3. Functions Generators-Sine and Square wave signals
4. Multimeters
5. Electronic Components

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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
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(20EC3PC06) SWITCHING THEORY AND LOGIC DESIGN LAB

Course Objectives:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To implement simple logical operations using combinational logic circuits
4. To design combinational logic circuits, sequential logic circuits.
5. To impart to student the concepts of sequential circuits, enabling them to Analyse sequential systems in terms of state machines.
6. To implement synchronous state machines using flip-flops

Course outcomes**:** Upon completion of the Course, the students will be able to:

1. Implement the logic gates using universal gates and verify the truth tables
2. Interpret the Boolean expression of SOP and POS using logic gates.
3. Construct combinational logical circuits (Adders, Subtractors, Encoders, Multiplexers).
4. Evaluate the SR, D, T and JK Flip Flops with their truth tables.
5. Design Synchronous and Asynchronous Sequential logical circuits.

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of an Universal shift register
7. Design and realization of a Synchronous and Asynchronous counter using flip-flops
8. Study of Flip-flops i) JK Flip-flop ii) D Flip-flop iii) T Flip-flop.
9. Design and realization of 8x1 MUX using 2x1 MUX
10. Design and realization of 4-bit comparator
11. Design and Realization of a sequence detector-a finite state machine.

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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
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(20EC3ES09) BASIC SIMULATION LAB

Course Objectives:

1. To provide background and fundamentals of MATLAB or equivalent tool for the analysis and processing of signals and to generate various continuous and discrete time signals.
2. To determine the Fourier, transform of signals and to convert a continuous time signal to discrete and reconstruction using Sampling theorem.
3. To apply convolution and correlation for continuous time signal.
4. To use Laplace and Z transforms for analyzing continuous /discrete time signals and systems

Course outcomes**:** Upon completion of the Course, the students will be able to

To Understand and Practice Simplifications.

1. To Understand and Practice the Problems on Ages.
2. To Understand and Practice the Quadratic Equations.
3. To Understand and Practice arrangement and selection in their daily life.
4. To Understand and Practice commercial mathematics.

List of Experiments:

1. Basic Operations on Matrices.
2. Generation of V0arious Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution for Signals and sequences.
6. Auto Correlation and Cross Correlation for Signals and Sequences
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical reliability and stability properties.
9. Gibbs Phenomenon Simulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for thegiven transfer function.
13. Implementation of Frequency Response of Low Pass RC Filter using Transform Techniques
14. Verification of Sampling Theorem
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Implementation of Frequency Response of HIGH Pass RC Filter using Transform Techniques.

Major Equipment's required for Laboratories:

1. Computer System with latest specifications connected Window XP or equivalent
2. Simulation software-MAT Lab or any equivalent simulation software

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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

(20MC3HS01) PROFESSIONAL ENGINEERING ETHICS

Course Objectives:

1. To enable the students to imbibe and internalize the Values and Ethical Behavior in thepersonal and Professional lives.

Course outcomes Upon completion of the Course, the students will be able to:

1. Apply Professional Ethics in Accountabilities
2. Choose ethical and Morals principles
3. Analise Professional Practices
4. Support Work Place Rights and Responsibilities
5. Discus in Global issues in Professional Ethics

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, ProfessionalRisks, 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, Engineersand Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domainsof 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.

TEXTBOOKS:

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

REFERENCE BOOKS:

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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II Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

(20MC3BS02) QUANTITATIVE APTITUDE

Course Objectives:

1. To improve the problem-solving skills.
2. To enhance the employability skills among students to meet out the corporate expectations.
3. To enhance the student's interest towards industry expectations.
4. To prepare students for the campus recruitment program.
5. To produce the most competitive man power to fit in all scenario of the job market.

Course outcomes The Students able

1. To Understand and Practice Simplifications.
2. To Understand and Practice the Problems on Ages.
3. To Understand and Practice the Quadratic Equations.
4. To Understand and Practice arrangement and selection in their daily life.
5. To Understand and Practice commercial mathematics.

Unit-I

Numbers, H.C.F & L.C.M. of Numbers, Decimal Fractions & Simplifications.

Unit-II

Square Roots & Cube Roots, Problems on Ages, Pipes & Cistern.

Unit-III

Average, Time & Distance, Time & Work, Logarithm, Set Theory, Progressions, Quadratic Equations and Surds.

Unit-IV

Permutation & Combination, Probability, Co-ordinate Geometry, Inequalities, Functions, Alligation & Mixtures, Number System.

Unit-V

Partnership, Profit & Loss, Simple & Compound Interest, Percentage, Ratio & Proportion, Mensuration 2D & 3D.

TEXTBOOKS:

1. R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning.

REFERENCE BOOKS:

1. Arun Sharma, Teach Yourself Quantitative Aptitude.
2. Rajesh Verma, Fast Track Objective Arithmetic.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examination.
4. Abhijit Gupta, Quantitative Aptitude for all Competitive Exam

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II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC4PC07) ANALOG AND DIGITAL COMMUNICATIONS

Course Objectives:

1. To develop ability to Analyse system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of Error Control Codes.

Course outcomes Upon completion of the Course, the students will be able to:

1. Apply Amplitude Modulation and Demodulation techniques in Communication System.
2. Use the concepts of Angle Modulation in communication system.
3. Analyse the working principle of analog transmitters and receivers.
4. Summarize the different pulse code modulation techniques.
5. Formulate error control codes and various modulation schemes in digital communication system

Unit-I

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

Unit-II

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de- emphasis, Comparison of TDM and FDM.

Unit-III

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

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

Unit-IV

Elements Of Digital Communication Systems: Model of DCS, Digital representation of Analog signal, Certain Issues in Digital Transmission, Advantages of digital communication systems.

Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non- Uniform Quantization and Commanding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

Unit-V

Error Control Codes: Matrix description of linear block codes, Error detection and error correction capabilities of linear block codes. Cyclic codes: Algebraic structure, encoding, Syndrome calculation, decoding. Convolution Codes: Encoding, decoding

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non-Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.

TEXTBOOKS:

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5thEdition, 2009, PHI.

REFERENCE BOOKS:

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3rd Edition,McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition, PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004
4. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005.
5. Communication Systems (Analog and Digital) -Sanjay Sharma, S.K. Kataria & Sons, 2013
6. Analog Communication Systems-P.Chakrabarthy, Dhanpat Rai & Co. 2011.

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II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC4PC08) ELECTROMAGNETIC FIELDS AND WAVES

Course Objectives:

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
2. To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
3. To Analyse the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
4. To conceptually understand the waveguides, their applications and to determine the characteristics ofrectangular waveguides

Course outcomes Upon completing this course, the student will be able to

1. Apply basic laws of Electrostatics.
2. Use the concepts of Magnetostatics
3. Deduce Maxwell's equations for static and dynamic fields.
4. Evaluate Uniform plane wave characteristics for different media.
5. Formulate wave characteristics for different angle of incidences and derive poynting theorem

Unit-I

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

Unit-II

Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Illustrative Problems.

Unit-III

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric- Conductor Interfaces, Illustrative Problems.

Unit-IV

EM Wave Characteristics-I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

Unit-V

EM Wave Characteristics-II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

TEXTBOOKS:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8th Ed., McGrawHill,2014
2. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Aisan Edition, 2015.

REFERENCE BOOKS:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed., 2000, PHI.
2. Engineering Electromagnetics – Nathan Ida, 2nd Ed., 2005, Springer (India) Pvt. Ltd., New Delhi.

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II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC4PC09) ANALOG AND PULSE CIRCUITS

Course Objectives:

1. Learn the concepts of low and high frequency analysis of single stage and multi stage transistors.
2. To give understanding of various types of amplifier circuits such as small signal, cascaded,large signal and tuned amplifiers.
3. To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback
4. To construct various sweep circuits using transistors

Course outcomes Upon completing this course, the student will be able to

1. Construct the single stage and Multistage Amplifiers to find frequency response of BJT Amplifiers.
2. Sketch the response of JFET Amplifiers at high frequencies.
3. Distinguish Feedback Amplifiers and Oscillators using BJT Transistors.
4. Compare different Power and Tuned amplifiers for Audio and Radio applications.
5. Design Multivibrators and Sweep circuits for various applications.

Unit-I

Analysis and Design of small signal Low Frequency Single stage BJT Amplifiers: Classification of amplifiers, Distortion in amplifiers, Analysis of CE, CB and CC Amplifiersamplifier with emitter resistance.

Analysis and Design of small signal Low Frequency Multi stage Amplifiers:
Different coupling schemes used in amplifiers, Frequency response of multistage amplifiers, Analysis of cascaded RC Coupled amplifiers, Analysis of Cascode amplifier, Analysis of Darlington pair

Unit-II

Transistor at High Frequency: Hybrid π - model of Common Emitter transistor model, $f\alpha$, $f\beta$ and unity gain bandwidth, Gain-bandwidth product.

JFET Amplifiers: Small signal Model, Analysis of CS, CD, CG, JFET Amplifiers, Comparison of performance with BJT Amplifiers.

Unit-III

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Crystal Oscillator.

Unit-IV

Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry

configurations, Conversion Efficiency, Principle of operation of Class AB and Class –C Amplifiers.
Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, Concept of stagger tuning and synchronous tuning.

Unit-V

Multivibrators: Analysis and Design of Bistable, Monostable, A stable Multivibrators andSchmitt trigger using Transistors.
Time Base Generators: General features of a Time base Signal, Methods of Generating TimeBase Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Pulse synchronization of A stable Multivibrator.

TEXTBOOKS:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education.
2. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, Pearson.
3. Milliman's Pulse, Digital and Switching Waveforms-J.Milliman, H. Taub and MothikiS Prakash Rao, 2nd ed.2008,TMH.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson
3. Pulse and Digital Circuits-A. Anand Kumar,2005, PHI

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II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20MA4BS07) NUMERICAL METHODS AND COMPLEX VARIABLES

Course Objectives:

1. Various methods to the find roots of an equation.
2. Concept of finite differences and to estimate the value for the given data using interpolation.
3. Evaluation of integrals using numerical techniques
4. Solving ordinary differential equations using numerical techniques.
5. Differentiation and integration of complex valued functions.
6 Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
7. Expansion of complex functions using Taylor's and Laurent's series.

Course outcomes After learning the contents of this paper the student must be able to

1. Estimate the value for the given data using interpolation.
2. Find the numerical solutions for a given ODE's.
3. Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
4. Apply Taylor's and Laurent's series expansions of complex Function.
5. Explain the transformations on different planes.

Unit – I

Algebraic and Transcendental Equations: Introduction – Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method.

Unit – II

Interpolation: Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation.

Unit – III

Numerical Differentiation and Integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order.

Unit – IV

Complex Differentiation: Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate**.**

Unit – V

Complex Integration: Line integrals, Cauchy's theorem, Cauchy's Integral formula, Cauchy's Integral theorem, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof). Bilinear Transformation, properties, cross ratio, fixed points

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. B.V. Ramana, Higher Engineering Mathematics- Tata McGraw Hill New Delhi- 11th Reprint-2010.
4. S.R.K. Iyengar and R.K. Jain, Advanced Engineering Mathematics by – Narosa Publications.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of engineering Mathematics- Laxmi Publications.
3. Babu Ram, Numerical methods, Pearson Education.
4. Michael Greenberg, Advanced Engineering Mathematics, Second Edition, Pearson Education

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC4PC10) LINEAR IC APPLICATIONS

Course Objectives: The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To introduce the concepts of waveform generation and introduce some special function ICs.

Course outcomes Upon completing this course, the student will be able to

1. Apply the inverting, non-inverting and differential concepts of Op- Amp.
2. Use the concepts of op-amp in various applications.
3. Distinguish filters and oscillators based on their working principle.
4. Interpret applications of IC 555 and IC 565.
5. Design ADC and DAC circuits.

UNIT - I

Integrated Circuits: Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

UNIT - II

Op-amp and Applications: Basic information of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723

UNIT - III

Active Filters & Oscillators: Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien and quadrature type, waveform generators - triangular, sawtooth, square wave and VCO.

UNIT – IV

Timers & Phase Locked Loops: Introduction to 555 timer, functional diagram, monostableand a stable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

Unit – V

D-A and A-D Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallelcomparator type ADC, counter type ADC, successive approximation ADC dual slope integration type ADC, DAC and ADC specifications.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGraw Hill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20EC4PC11) Analog and Digital Communications Lab

Course Objectives: The main objectives of the course are

1. To understand modulation, demodulation techniques used in communication system, and develop the Modulation techniques used in both time and frequency domains.
2. To gain the knowledge on pre-emphasis and de-emphasis circuits used in analog communication.
3. To apply sampling theorem for converting analog signals to digital signals.
4. To understand the functional block diagram of Digital Communication system and various digital modulation techniques

Course outcomes Upon completing this course, the student will be able to

1. Demonstrate the effect of negative feedback on the frequency response of Feedback Amplifiers
2. Calculate operating frequency of RC and LC Oscillators.
3. Analyse the frequency response of Multistage Amplifiers.
4. Evaluate response of Multivibrators and Sweep circuits.
5. Simulate analog circuits for any given parameters using Multisim Software.

List of Experiments:

1. (i) Amplitude modulation and demodulation (ii) Spectrum analysis of AM
2. (i) Frequency modulation and demodulation (ii) Spectrum analysis of FM
3. DSB-SC Modulator & Detector
4. SSB-SC Modulator & Detector (Phase Shift Method)
5. Frequency Division Multiplexing & De multiplexing
6. Time Division Multiplexing & De multiplexing
7. PCM Generation and Detection
8. Delta Modulation
9. Amplitude Shift Keying: Generation and Detection
10. Frequency Shift Keying: Generation and Detection
11. Binary Phase Shift Keying: Generation and Detection
12. Generation and Detection of DPSK
13. Generation and Detection of QPSK

Major Equipment's required for Laboratories:

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyse r
4. Regulated Power Supplies: 0-30V
5. MAT Lab/Equivalent Simulation Package with Communication tool box
6. Analog and Digital Modulation and Demodulation Trainer Kits

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20EC4PC12) ANALOG AND PULSE CIRCUITS LAB

Course Objectives: The main objectives of the course are:

1. To train the students the operational principle, analysis, design and application of the Bipolar Junction Transistor (BJT).
2. To train the students the operational principle, analysis, design and application of the Field Effect Transistor (FET).
3. To develop the students' ability on conducting engineering experiments, Analyse experimental observations scientifically.
4. To initiate the students the understanding of the concepts, know-how Multisim or P-spice or Equivalent Simulation software is used for circuit design.

Course outcomes Students able to

1. Simulate the electronic circuits using Multisim Software.
2. Analyse the frequency response of single and multi-stage Amplifiers
3. Examine the effect of negative feedback on the frequency response of feedback amplifiers.
4. Determine the frequency of Oscillations for RC and LC oscillators.
5. Design the Multivibrators and Sweep Circuits**.**

Note:

Experiments marked with ***** has to be designed, simulated and verified in hardware.
Minimum of 10 experiments to be done in hardware

List of Experiments:

1. Two Stage RC Coupled Amplifier **(*)**
2. Cascode amplifier Circuit **(*)**
3. Darlington Pair Circuit
4. Current Shunt Feedback Amplifier Circuit
5. Voltage Series Feedback Amplifier Circuit **(*)**
6. RC Phase shift Oscillator Circuit **(*)**
7. Hartley and Colpitts Oscillators Circuit
8. Class A power amplifier
9. Class B Complementary symmetry amplifier **(*)**
10. Design a Bistable Multivibrator and draw its waveforms.
11. Design an Astable Multivibrator and draw its waveforms.
12. Design a Monostable Multivibrator and draw its waveforms**.**
13. Response of Schmitt Trigger circuit for loop gain less than and greater than one.
14. The output voltage waveform of Bootstrap Sweep Circuit
15. The output voltage waveform of Miller Sweep Circuit
16. Pulse Synchronization of an Astable circuit**.**

Major Equipment's required for Laboratories:

1. Computer System with latest specifications connected
2. Window XP or equivalent
3. Simulation software-Multisim or any equivalent simulation software
4. Regulated Power Supply, 0-30V

5. 20 MHz, Dual Channel Cathode Ray Oscilloscope.
6. Function Generators-Sine and Square wave signals
7. Multimeters
8. Electronic Components

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EC4PC13) IC APPLICATIONS LAB

Course Objectives: The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory of operational amplifiers and PLL.
3. To introduce the theory of applications of PLL.
4. To introduce the concepts of waveform generation.
5. To teach the theory of ADC and DAC.

Course outcomes Upon completing this course, the student will be able to

1. Construct the various linear and Non-linear circuits of opamp
2. Sketch the frequency response of low pass and high pass filters for specified passband gain
3. Compare characteristics of voltage regulators
4. Evaluate parameters of multivibrators using IC555
5. Design PLL using IC 565 for various applications

Design and Implementation of:

1. Inverting and Non-Inverting Amplifiers using Op Amps
2. Adder and Subtractor using Op Amp.
3. Comparators using Op Amp.
4. Integrator Circuit using IC 741.
5. Differentiator Circuit using Op Amp.
6. Active filter Applications-LPF, HPF (First Order)
7. IC 741 waveform Generators-Sine, Square wave and Triangular Waves.
8. Mono-Stable Multivibrator using IC 555.
9. Astable multivibrator using IC 555.
10. Schmitt Trigger Circuits using IC 741.
11. IC 565-PLL Applications.
12. Voltage Regulator using IC 723
13. Three terminal voltage regulators-7805, 7809, 7912

Major Equipment's required for Laboratories:

1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multimeter.

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II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

(20MC4HS03) GENDER SENSITIZATION LAB

Course Description

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmer combating gender- based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development

Course Objectives:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women

Course outcomes

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of lab hour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT – I

Understanding Gender

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men, Preparing for Womanhood, Growing up Male, First lessons in Caste.

UNIT – II

Gender Roles and Relations

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences
- Declining Sex Ratio. Demographic Consequences - Gender Spectrum: Beyond the Binary

UNIT – III

Gender and Labour

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.- Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

UNIT – IV

The Concept of Violence-

Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim- "I Fought for my Life…."

Unit – V

Gender and Culture

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Issues- Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

TEXTBOOKS:

"*Towards a World of Equals:* *A Bilingual Textbook on Gender" written* by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

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II Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

(20MC4BS03) QUANTITATIVE LOGICAL AND REASONING

Course Objectives: The students learn

1. To improve the Logical Ability and Reasoning skills among the students to meet the expectations of Industry.
2. To counsel the students to improve their career exposure across the industry
3. To improve the Data Sequences & Calendars problems.
4. To enhance Non-Verbal Reasoning among the students as per the industry requirements
5. To improve the graphical representation skills among the students.

Course outcomes The Students able

1. To understand and practice logical reasoning
2. To understand and practice the different classifications
3. To understand and practice different Sitting Arrangements, Data Sequences.
4. To understand and practice the Non-Verbal Reasoning.
5. To understand and practice the graphs.

UNIT – I

Coding Decoding, Directions, Blood Relations & Alphabet Test.

UNIT – II

Statements & Arguments, Analogy Classification & Clocks.

UNIT – III

Sitting Arrangements, Data Sequences & Calendars and Syllogism.

UNIT – IV

Puzzle Test, Non-Verbal Reasoning, Cubs & Dice.

Unit – V

Tabulation, Bar Graphs, Pie Charts and Line Graphs.

REFERENCE BOOKS:

1. R.V.Praveen, Quantitative Aptitude and Reasoning
2. Praxis groups, Campus Recruitment Complete Reference
3. Praxis groups, Campus Recruitment Complete Reference. 3. BS Sijwalii & Indu Sijwali, A New Approach to Reasoning Verbal, Non-Verbal & Analytical

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III Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20MS5HS03) BUSINESS ECONOMICS & FINANCIAL ANALYSIS

Course Objective: To learn the basic Business types, impact of the Economy on Business and Firms specifically. To Analyse the Business from the Financial Perspective.

Course outcomes

1. Illustrate business and economics in small firms and companies
2. Apply supply forecast based on demand
3. Analyse Production, Cost, Market Structures & Pricing
4. Evaluate the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts
5. Formulate fundamental accounting concepts and Ratio analysis

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

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, Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT – IV

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.

Unit – V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

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.

REFERENCE BOOKS:

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

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III Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC5PC14) ANTENNA AND WAVE PROPAGATION

Pre-requisite: Electromagnetic Theory and Transmission Lines

Course Objectives: The course objectives are

1. To understand radiation, antenna parameters and to analyse thin wire dipole antennas
2. To identify antenna array requirements and characteristics of antenna arrays.
3. To understand the set-up requirements for microwave measurements
4. To analyse the characteristics of UHF, VHF and Microwave Antennas.
5. To distinguish between different phenomenon of wave propagations

Course outcomes Upon completing this course, the student will be able to

1. Discover antennas based on frequency and establish radiation patterns of the antennas
2. Demonstrate antenna arrays and various antenna measurement methods
3. Explain the design consideration of VHF, UHF and microwave antennas
4. Evaluate the performance of Microstrip and Reflector antennas
5. Investigate mechanisms and characteristic features of different wave propagations

UNIT – I

Antenna Basics: Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Apertures, Effective Height.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment). Related simple problems

UNIT – II

Antenna Arrays: Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions –Binomial Arrays.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate

System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

UNIT – III

VHF, UHF and Microwave Antennas - I: Arrays with Parasitic Elements, Yagi-Uda Array, Folded

Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations. Related simple problems

UNIT – IV

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types. Related simple problems

Unit – V

Wave Propagation - Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts. **Ground Wave Propagation** –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. **Space Wave Propagation –**Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation. **Sky Wave Propagation** –Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation. Related simple problems

TEXT BOOKS:

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed.,2000.

REFERENCE BOOKS:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Radio Engineering Handbook- Keith henney, 3rd edition TMH.
4. Antenna Engineering Handbook –John Leonidas Volakis, 3rd edition, 2007

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III Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC5PC15) COMPUTER NETWORKS

Pre-requisite: Digital Communications

Course Objectives:

1. To understand the source and channel coding schemes.
2. To introduce the fundamental various types of computer networks.
3. To demonstrate the TCP/IP and OSI models with merits and demerits.
4. To introduce the concepts of various layers

Course outcomes Upon completing this course, the student will be able to

1. Demonstrate network models, network types and transmission media.
2. Illustrate Data link layer Protocols
3. Compare the Virtual Vs datagram networks, Ipv4 Vs Ipv6 and various routing protocols.
4. Determine the connection oriented, connectionless and web application services.
5. Test a wireless network using IEEE standards**.**

UNIT – I

Computer Networks and the Internet: Internet, Network Edge, the Network Core,Delay and Loss in Packet-Switched Networks,Protocol Layers and Their Service Models.
Network Models: Layered Tasks, OSI Model, Layers in OSI Model, TCP/IP Protocol Suite, Addressing.
Transmission Media: Guided Media, Unguided Media- Wireless**.**

UNIT – II

Data Link Layer: Channel coding- Hamming coding, Block Coding, Cyclic Codes, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point-to-Point Protocol (PPP), Random Access, Controlled Access, Channelization.

UNIT – III

Network Layer: Introduction Virtual Circuit and Datagram Networks, Internet Protocols-IPv4 and IPv6, Router, Routing Algorithms, Broadcast and Multicasting Routing.

UNIT – IV

Transport Layer: Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport - UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport-TCP, Principles of Congestion Control.

Application Layer: Principles of Network Applications, WWW and HTTP, FTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications, Socket Programming, Creating Network Applications.

Unit – V

Wireless and Mobile Networks: Introduction, Wireless Links and Network Characteristics, Wi-Fi, IEEE 802.11 Wireless LANs,IEEE 802.15, IEEE 802.16, Concept of OFDM with Block Diagram.

TEXT BOOKS:

1. Data Communications and Networking – Behrouz A. Forouzan, 4th & 5th Ed., TMH, 2006.
2. Computer Networks -- Andrew S Tanenbaum, 3th Ed., Pearson Education, 1999.

REFERENCE BOOKS:

1. Computer and Communication Networks, Nader F. Mir, Pearson Education, 2010.
2. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, 3rd Ed., Pearson Education, 2010.
3. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor andFrancis Group, 2010.
4. Data Communications and Computer Networks, P.C.Gupta, PHI, 2nd Ed., 2010.

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III Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC5PC16) MICROPROCESSORS AND MICROCONTROLLERS

Pre-requisite: Switching Theory and Logic Design

Course Objectives:

1. To familiarize the architecture of microprocessors and micro controllers
2. To provide the knowledge about interfacing techniques of bus & memory.
3. To understand the concepts of ARM architecture
4. To study the basic concepts of Advanced ARM processors

Course outcomes Upon completing this course, the student will be able to

1. Apply the concept of addressing modes and data transfer instructions of 8086 microprocessors for Arithmetic and Logical Unit Operation.
2. Analyse the concepts of internal architecture, organization of 8051 to solve real time applications.
3. Analyse various interfacing devices with 8051 microcontrollers.
4. Evaluate simple programs using Assembly Language Program of ARM and their instruction formats.
5. Explain the architecture of Advanced ARM Processors.

UNIT – I

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT – II

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, MemoryOrganization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters.

UNIT – III

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB.

UNIT – IV

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

Unit – V

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004
3. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier,2012

REFERENCE BOOKS:

1. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
2. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, and he Pallavi, Pearson, 2009.
3. Digital Signal Processing and Applications with the OMAP- L138 Experimenter, Donald Reay,WILEY 2012.

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III Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EC5PC17) COMPUTER NETWORKS LAB

Course Objectives:

1. To understand the performance of various LAN Topologies
2. To describe performance of TCP and UDP Protocols.
3. To demonstrate performance of IEEE 802.11 and IEEE 802.15.4 with merits and demerits.
4. To Analyse of ICMP and IGMP Packets

Course outcomes Upon completing this course, the student will be able to

1. Demonstrate network models, network types and transmission media.
2. Illustrate Data link layer Protocols
3. Compare the Virtual Vs datagram networks, Ipv4 Vs Ipv6 and various routing protocols.
4. Determine the connection oriented, connectionless and web application services.
5. Test a wireless network using IEEE standards

Note:

A. Minimum of 12 Experiments have to be conducted

B. All the Experiments may be Conducted using Network Simulation software likeNS-2/NS3/ NSG-2.1/Wire SHARK/ etc.
Note: For Experiments 2 to 10 Performance may be evaluated through simulation by using the parameters Throughput, Packet Delivery Ratio, Delay etc.

1. Writing a TCL Script to create two nodes and links between nodes
2. Writing a TCL Script to transmit data between nodes
3. Evaluate the performance of various LAN Topologies
4. Evaluate the performance of Drop Tail and RED queue management schemes
5. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
6. Evaluate the performance of TCP and UDP Protocols
7. Evaluate the performance of TCP, New Reno and Vegas
8. Evaluate the performance of AODV and DSR routing protocols
9. Evaluate the performance of AODV and DSDV routing protocols
10. Evaluate the performance of IEEE 802.11 and IEEE 802.15.4
11. Evaluate the performance of IEEE 802.11 and SMAC
12. Capturing and Analysis of TCP and IP Packets
13. Simulation and Analysis of ICMP and IGMP Packets
14. Analyse the Protocols SCTP, ARP, NetBIOS, IPX VINES
15. Analysis of HTTP, DNS and DHCP Protocols

* Simulation of the above experiments to be conducted using NS-2, NSG 2.1, Wire Shark.

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	0	**0**	**3**	**1.5**

(20EC5PC18) Microprocessors and Microcontrollers Lab

Course Objectives:

1. To familiarize the architecture of microprocessors and microcontrollers.
2. To develop assembly level language programming on microcontroller-based system.
3. To provide the knowledge about interfacing techniques of bus & memory**.**

Course outcomes Upon completing this course, the student will be able to

1. Demonstrate the concept of addressing in 8086 for arithmetic, logical, string and bit level operations.
2. Experiment the concept of arithmetic, logical, bit manipulation and branching instructions using 8051 microcontrollers.
3. Analyse the serial and parallel communication in 8051 Microcontroller.
4. Design the given system using interrupt controller in 8051 microcontrollers.
5. Build 8051 microcontroller with input and output devices.

Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)

- Assembly Language Programs to 8086 to Perform

1. Arithmetic, Logical, String Operations on 16 Bit and 32-Bit Data
2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit (6 weeks)

- Introduction to IDE

1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
2. Time delay Generation Using Timers of 8051.
3. Serial Communication from / to 8051 to / from I/O devices.
4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer 0 8051 in 8 bit Auto reload Mode and Connect a 1 HZ Pulse to INT1 pin and Displayon Port 0. Assume Crystal Frequency as 11.0592 MHZ

Cycle 3: Interfacing I/O Devices to 8051(5 Weeks)

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8-bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals by A K Ray, Tata McGraw-Hill Education, 2006
The 8051 *Microcontrollers*: Architecture, Programming & Applications by Dr. K. Uma Rao,

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	0	**0**	**2**	**1**

(20EN5HS04) ADVANCED COMMUNICATION SKILLS LAB

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

Course outcomes Upon completing this course, the student will be able to

1. Develop LSRW skills and soft skills.
2. Demonstrate the nuances of language through group activities and oral presentations.
3. Build written communication skills to meet the needs of their academic and career endeavours.
4. Take part in interviews with confidence thereby enhancing their employability skills.
5. Choose appropriate

UNIT – I

Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary

UNIT – II

General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

UNIT – III

Activities on Writing Skills – Subject-Verb Agreement, Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing

UNIT – IV

Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc..

Unit – V

Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

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	3	**0**	**0**	**0**

(20EN5HS05) INTELLECTUAL PROPERTY RIGHTS

Course Objectives:

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects
4. To disseminate knowledge on trademarks and registration

Course outcomes Upon completing this course, the student will be able to

1. Use intellectual property by interpreting various rights ensured by IPR to the intellectuals
2. Demonstrate various processes involved in acquiring trademarks.
3. Distinguish the features of copyrights and patterns.
4. Explain the laws and the extent they protect trade secrets.
5. Discuss new developments of intellectual property

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, 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: Fundamental of copy right law, originality of material, rights of reproduction, rightsto perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade screte litigation. Unfair competition: Misappropriation right

Unit – V

: New development of intellectual property: 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 & REFERENCE BOOKS:

1. Intellectual property right, Deborah, E. Bou choux, Cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw HillPublishing Company Ltd.

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	2	**0**	**0**	**0**

(20MC5HS06) PERSONALITY DEVELOPMENT AND SOFT SKILLS

Course Objectives:

1. Projecting the Right First Impression
2. Polishing manners to behave appropriately in social and professional circles
3. Enhancing the ability to handle casual and formal situations in terms of personal grooming, dining and entertaining etiquette
4. Developing and maintaining a positive attitude and being assertive
5. Mastering Cross Cultural Etiquette
6. Handling difficult situations with grace, style, and professionalism
7. To understand the importance of oral & written Communication Skills in Corporate Sector.

Course outcomes Upon completing this course, the student will be able to

1. Students will possess the personality development techniques and communication skills.
2. Students will possess knowledge about leadership.
3. Students will be able to acquire the skills to manage stress and conflict.
4. Students will able to acquire Problem Solving & Critical Thinking.
5. Students will able to acquire different resume preparation & Essay Writing Techniques

UNIT – I

Personality Development Body Language: Professional and Casual attire, Public Speaking, Strengths & Weakness, Organizational Skills, Self-Assessment.

UNIT – II

Goal Setting: Time Management, Stress Management, Career Management, Confidence / Motivation, Tolerance of Change and Uncertainty.

UNIT – III

Soft Skills Grammar: Noun, Pronoun, Adjectives, Tenses, Verb, Subject + Verb, Agreement, Adverb, Preposition, Article, Conjunction.

Vocabulary: Synonyms & Antonyms, Words often Confused & Misused

Verbal Ability: Sentence Improvement, Reading Comprehension, Cloze Test, Sentence Rearrangements, Fill in the Blanks, Theme Detection Analogy

UNIT – IV

Just A Minute (JAM), Group Discussion (GD), Debate, Role Play, Cognitive Skills, Leadership Qualities, Work Ethics, Problem Solving & Adaptability, Critical Thinking, Random Words, and Interview Skills: Tell me about yourself.

Unit – V

Team Work, Self-Awareness and Presentation Skills, Resume Building: Normal Resume Preparation, Video Resume & Career Specific Resume, Email Etiquette, Essay Writing.

TEXT BOOKS:

1. Personality Development and Soft Skills - Barun K. Mitra
2. Personality Development and Soft Skills: Preparing for Tomorrow - Shikha Kapoor
3. Soft Skills Personality Development for Life Success – Prashanth Sharma.

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III Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC5PE11) COMPUTER ORGANIZATION AND OPERATING SYSTEMS
(Professional Elective – I)

Course Objectives:

1. To have a thorough understanding of the basic structure and operation of a digital computer.
2. To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
3. To study the different ways of communicating with I/O devices and standard I/O interfaces.
4. To study the hierarchical memory system including cache memories and virtual memory.
5. To demonstrate the knowledge of functions of operating system memory management scheduling, file system and interface, distributed systems, security and dead locks.
6. To implement a significant portion of an Operating System.

Course outcomes Upon completion of the course, students will have through knowledge about:

1. Sketch the basic structure of a digital computer.
2. Sketch the Arithmetic operations of binary number system.
3. Identify the organization of the Control Unit, Arithmetic and Logical Unit, Memory Unit .
4. Illustrate the design of Memory unit and overview of Principles of Deadlock.
5. Compile the major activities of OS with regard to file management

UNIT – I

Basic Structure of Computers: Computer Types, Functional UNIT, Basic Operational Concepts, Bus, Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating - Point Representation.

Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions - Instruction Cycle.

Memory - Reference Instructions, Input - Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

UNIT – II

Micro Programmed Control: Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Microprogrammed Control.

The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories secondary Storage, Introduction to RAID

UNIT – III

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input-Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

UNIT – IV

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating System Generation.

Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows

Principles of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit – V

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, Directory Implementation, Allocation Methods, Free-Space Management.

TEXT BOOKS:

1. Computer Organization - Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer System Architecture - M. moris mano, 3rd edition, Pearson
3. Operating System Concepts - Abreham Silber chatz, Peter B. Galvin, Greg Gagne, 8th Edition, John Wiley.

REFERENCE BOOKS

1. Computer Organization and Architecture - William Stallings 6th Edition, Pearson
2. Structured Computer Organization - Andrew S. Tanenbaum, 4th Edition, PHI
3. Fundamentals of Computer Organization and Design – Sivaraama Dandamudi, Springer Int. Edition
4. Operating Systems - Internals and Design Principles, Stallings, 6th Edition - 2009, Pearson Education.
5. Modern Operating Systems, Andrew S Tanenbaum 2nd Edition, PHI
6. Principles of Operating System, B. L. Stuart, Cengage Learning, India Edition.

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III Year B.Tech. ECE – I Sem

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3	0	0	3

(20EC5PE12) Electronic Measurements and Instrumentation

(Professional Elective – I)

Course Objectives:

1. It provides an understanding of various measuring system functioning and metrics for performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal Analyse rs, recorders and measuring equipment.
3. Understanding the concepts of various measuring bridges and their balancing conditions.
4. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course outcomes Upon completing this course, the student will be able to

After completion of the course students will be able to

1. Calculate the electrical parameters for different meters
2. Modify the signals by using signal generators and Analyse rs
3. Analyse signals using different Cathode Ray Oscilloscopes
4. Measure the Force, Resistance, Temperature, etc., using transducers
5. Formulate the procedures of measuring physical parameters

UNIT – I

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, DynamicCharacteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments

UNIT – II

Signal Analyse rs: AF, HF Wave Analyse rs, Harmonic Distortion, Heterodyne wave Analyse rs, Spectrum Analyse rs, Power Analyse rs, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT – III

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT – IV

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchro's, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers of publicity, false advertising.

Unit – V

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.
Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture.

TEXT BOOKS:

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D. Cooper: PHI 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

REFERENCE BOOKS

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpat Rai & Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
3. Industrial Instrumentation: T.R. Padmanabham Springer 2009.
4. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010

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III Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC5PE13) DATA ANALYTICS
(Professional Elective – I)

Prerequisites

1. A course on "Database Management Systems".
2. Knowledge of probability and statistics.

Course Objectives:

1. To explore the fundamental concepts of data analytics.
2. To learn the principles and methods of statistical analysis
3. Discover interesting patterns, Analyse supervised and unsupervised models and estimate the accuracy of the algorithms.
4. To understand the various search methods and visualization techniques.

Course outcomes After completion of this course students will be able to

After completion of the course students will be able to

1. Design data architecture for data management & Processing.
2. Identify the impact of data analytics for business decisions and strategy
3. Carry out data analysis/statistical analysis
4. Compile various Data Regression and Segmentation techniques
5. Prepare standard data visualization and formal inference procedures

UNIT – I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT – II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modelingin Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputationsetc. Need for Business Modeling.

UNIT – III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT – IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, over fitting, Pruning and Complexity, Multiple Decision Trees etc.Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc. and Analyse for prediction

Unit – V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan KaufmannPublishers.

REFERENCE BOOKS

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milli way LabsJeffrey D Ullman Stanford Univ.

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III Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC6PC19) CONTROL SYSTEMS

Course Objectives:

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving it
3. To assess the system performance using frequency domain analysis and techniques for improving the performance
4. To design various controllers and compensators to improve system performance

Course outcomes After completion of this course students will be able to

After completion of the course students will be able to

1. Apply the dynamics of Control System and Obtain its Transfer Function.
2. Demonstrate system performance and assess its Stability in time domain.
3. Analyse Stability of Control System in frequency domain through various techniques.
4. Evaluate different controllers by Root Loci, Bode plot method etc.
5. Test systems through State Space Representation**.**

UNIT – I

Introduction to Control Problem: Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra- Representation by Signal flow graph - Reduction using mason's gain formula.

UNIT – II

Time Response Analysis of Standard Test Signals: Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNIT – III

Frequency-Response Analysis: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

UNIT – IV

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers

Unit – V

State Variable Analysis and Concepts of State Variables: State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space

TEXT BOOKS:

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.

REFERENCE BOOKS

1. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.
2. A. NagoorKani, "Control Systems Engineering", CBS PUB & DIST PVT Limited, 2020

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	3	**1**	**0**	**4**

(20EC6PC20) DIGITAL SIGNAL PROCESSING

Course Objectives:

1. To provide basic knowledge on material for the analysis and processing of digital signals and their system responses.
2. To understand the computation of DFT and appreciate the fast computation FFT processing.
3. To understand the designs and structures of digital (IIR and FIR) filters furthermore Analyse and synthesize for a given specifications.
4. To acquaint in multi-rate signal processing techniques and finite word length effects.

Course outcomes Upon completing this course, the student will be able to

1. Apply the concepts of linear difference equations and multi-rate digital signal processing on given DTS.
2. Use DFT and FFT concepts to obtain frequency domain characteristics of a given DTS.
3. Analyse analog and digital IIR filters for given specifications.
4. Evaluate analog and digital FIR filters for the given specifications.
5. Synthesize digital filters and discuss finite word length effects.

UNIT – I

Introduction: Introduction to Digital Signal Processing: Definition, Block Diagram, Advantages and Applications of Digital Signal Processing, Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion. Sampling Rate Conversion by an arbitrary factor, Application of Multirate Signal Processing

UNIT – II

Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Circular Convolution, Linear with Circular Convolution, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z- Transform

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT – III

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters-Approximation of derivatives, Impulse Invariant Techniques, Bilinear Transformation Method and Matched Z-Transform technique. Spectral Transformations.

UNIT – IV

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

Unit – V

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms. models of linear discrete-time systems. Stability of linear discrete-time systems.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS:

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

REFERENCE BOOKS

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

Recommended:

1. Digital Signal Processing-P.Ramesh Babu, Scitech Publications Sixth Edition

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III Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EC6PC21) VLSI DESIGN

Pre-requisite: Electronic Circuit Analysis; Switching Theory and Logic Design

Course Objectives: The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to Analyse the behavior of inverters designed with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of any system using gates.
5. Understand basic programmable logic devices and testing of CMOS circuits

Course outcomes Upon completing this course, the student will be able to

1. Apply VLSI processing techniques and calculate electrical properties of MOS circuits.
2. Apply Lamda –rules to draw layout of IC's.
3. Analyse alternate circuits to find area, capacitance and delay of gates.
4. Evaluate data path and array subsystems
5. Design programmable logic devices and test CMOS.

UNIT – I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &Bic MOS

Basic Electrical Properties: Basic Electrical Properties of MOS and Bic MOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT - II

VLSI Circuit Design Processes: VLSI design flow - Floor planning and placement, Routing.

MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT – III

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.

UNIT - IV

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories, Content Addressable memory.

UNIT - V

Programmable Logic Devices: Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs.

CMOS Testing: CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques, Built in self-Repair (BISR).

TEXT BOOKS:

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

REFERENCE BOOKS

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John. P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K. Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.

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(20EC6PC22) DIGITAL SIGNAL PROCESSING LAB

Course Objectives:

1. To gain hands on experience for generating signal waveforms, computation of signals using DFT and FFT.
2. To generate frequency response for LP filter and HP filter using IIR and FIR filter designing methods.
3. To Observe the sampling response of system for interpolation, decimation and I/D sampling rate converters.

Course outcomes

1. Apply DFT on a given discrete time signals to obtain their characteristics.
2. Utilize FFT & DFT on a given signal & interpret the complexity.
3. Analyse IIR through Butterworth and Chebyshev filter techniques.
4. Evaluate FIR for LP and HP by windowing techniques.
5. Simulate Multi-rate signal processor response for given specifications in MATLAB 2020

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

Note: Minimum of 12 experiments has to be conducted

List of Experiments:

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Program to obtain Linear Convolution of two finite length sequences.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Program to obtain Circular Convolution of two finite length sequences.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems

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(20EC6PC23) E-CAD LAB

Course Objectives:

1. To learn the HDL programming language.
2. To learn the simulation of basic gates using the HDL.
3. To learn the simulation of combinational and sequential circuits using HDL.
4. To learn the synthesis and layouts of analog and digital CMOS circuits.
5. To develop an ability to simulate and synthesize various digital circuits.

Course outcomes at the end of the course, students will be able to

1. Build digital circuits with HDL programming language.
2. Construct combinational and sequential circuits in HDL and verify their performance.
3. Analyse any given circuits and compare them.
4. Evaluate different layout of CMOS circuits.
5. Compile combinational and sequential circuits on FPGA for any given specifications.

Note: Any SIX of the following experiments from each part are to be conducted

Part - I

All the following experiments have to be implemented using HDL

1. Realize all the logic gates
2. Design of 8-to-3 encoder (without and with priority) and 2-to-4 decoder
3. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer
4. Design of 4 bit binary to gray code converter
5. Design of 4-bit comparator
6. Design of Full adder using 3 modeling styles
7. Design of flip flops: SR, D, JK, T
8. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter
9. Finite State Machine Design

Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis for the following:

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/ NAND gates
4. CMOS XOR and MUX gates
5. Static / Dynamic logic circuit (register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate)

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(20EC6PC24) Python Programming LAB

Course Objectives:

1. To be able to introduce core programming basics and program design with functions using Python programming language.
2. To understand a range of Object-Oriented Programming, as well as in-depth data and• information processing techniques.
3. To understand the high-performance programs designed to strengthen the practical expertise.

Course outcomes at the end of the course, students will be able to

1. Apply basic concepts and the contributions of scripting language
2. Experiment the object-oriented concepts and built-in objects of Python.
3. Examine practically and contemporary applications in TCP/IP network programming.
4. Determine various mathematical solutions.
5. Test various functions and inputs to sort them based on given requirements

List of Experiments:

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a Python script that prints prime numbers less than 20.
10. Write a python program to find factorial of a number using Recursion.
11. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides)
12. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
13. Write a python program to define a module and import a specific function in that module to another program.
14. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
15. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
16. Write a Python class to implement pow (x, n)

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(20EC6PE21) CELLULAR AND MOBILE COMMUNICATIONS
(Professional Elective – II)

Course Objectives:

1. To provide the student with an understanding of the Cellular concept,Frequency reuse, Hand-off strategies.
2. To enable the student to Analyse and understand wireless and mobilecellular communication systems over a stochastic fading channel
3. To provide the student with an understanding of Co-channel and Non-Co-channel interferences
4. To give the student an understanding of cell coverage for signal andtraffic, diversity techniques and mobile antennas.

Course outcomes By the end of the course, the student will be able to

1. Interpret cellular concept, fading parameters, Frequency reuse and Cell splitting in wireless systems.
2. Discuss Co-channel Non-Co-channel interference in cellular and mobile communication systems.
3. Analyse signal and traffic conditions in different cell coverage areas through various propagation models
4. Evaluate channel and manage frequency of cell sites and mobile units.
5. Justify handoff techniques and dropping rates in cell sites.

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UNIT – I

Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trucking and Grade of Service, Improving Coverage andCapacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT – II

Co-Channel Interference: Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Umbrella Pattern Antenna, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT – III

Cell Coverage for Signal and Traffic: Signal Reflections in Flat and Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long-Distance Propagation, Path Loss from a Point-to-Point Prediction Model in Different Conditions, Merits of Lee Model.

UNIT – IV

Frequency Management and Channel Assignment: Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization,Overlaid Cells, Non-Fixed Channel Assignment.

Unit – V

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoffs, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd 1989.
2. W wireless Communications - Theodore. S. Rapport, PearsonEducation, 2nd Edn., 2002.
3. Mobile Cellular Communication – Gottapu sashibhushana Rao,Pearson, 2012.
4. Modern Wireless Communications-Simon Hay kin, MichaelMoher, Pearson Education, 2005.
5. Wireless Communications – Andrea Goldsmith, Cambridge UniversityPress, 2005.

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(20EC6PE22) EMBEDDED SYSTEM DESIGN
(Professional Elective – II)

Course Objectives:

1. To provide an overview of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware.
3. To understand the necessity of operating systems in correlation with hardware systems.
4. To learn case studies on embedded system design application.

Course outcomes: Upon completing this course, the student able to

1. Apply various Embedded system attributes different applications.
2. Use suitable hardware and interfacing components in Embedded Systems.
3. Differentiate Embedded circuits and Firmware methods.
4. Explain the basic concepts of Real Time operating systems.
5. Summarize concept of Task communication and synchronization in RTOS.

UNIT – I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded systems.

UNIT II

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces, Other system components

UNIT III

Embedded Firmware: Embedded Firmware Design Approaches, Embedded firmware Development Languages and Embedded C programming

UNIT -IV

RTOS Based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process, Threads, Multiprocessing and Multi-tasking, Task Scheduling, Threads-Processes-Scheduling putting them together, Task Communication, Task Synchronization, Device Drivers, how to choose an RTOS

UNIT –V

Embedded System Application and Development: case study of washing machine, battery operated smart card reader, digital camera and automated meter reading system

TEXT BOOKS:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013 5. An Embedded Software Primer - David E. Simon, Pearson Education

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(20EC6PE23) INFORMATION THEORY AND CODING
(Professional Elective – II)

Course Objectives:

1. To acquire the knowledge in measurement of information and errors.
2. Understand the importance of various codes for communication systems.
3. To design encoder and decoder of various codes.
4. To know the applicability of source and channel codes.

Course outcomes: Upon completing this course, the student able to

1. Apply the concepts in measurement of information and errors.
2. Designing various source codes and channel codes.
3. Design encoders and decoders for block and cyclic codes.
4. Analyse the significance of codes in various applications.
5. Exercise on BCH Codes and error corrections.

UNIT I

Coding for Reliable Digital Transmission and storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies. Source Codes: Shannon-Fano coding, Huffman coding

UNIT II

Linear Block Codes Introduction to Linear Block Codes, 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, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT III

Cyclic Codes Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT IV

Convolutional Codes Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT V

BCH Codes Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello, Jr, Prentice Hall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing, 1989.

REFERENCE BOOKS:

1. Digital Communications- John G. Proakis, 5th Ed., TMH, 2008.
2. Introduction to Error Control Codes-Salvatore Grava no, oxford
3. Error Correction Coding – Mathematical Methods and Algorithms - Todd K. Moon, Wiley India, 2006.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed., TMH

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(20EC6OE11) PRINCIPLES OF ELECTRONIC COMMUNICATIONS

(Open Elective - I)

Course Objectives:

1. Introduce the students to modulation and various analog and digital modulation schemes.
2. They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts

Course outcomes: Upon completing this course, the student able to

1. Use the concepts of modulation in calculating various parameters.
2. Apply different modulation and demodulation techniques in suitable application
3. Describe operations of telecommunication systems in different area networks
4. Recognize the use of satellite communications
5. Analyse Different technologies in cellular and mobile communications

UNIT – I

Introduction: Introduction to Electronic Communication System, Types of Electronic Communication, Electromagnetic spectrum, Bandwidth Requirements, Need for Modulation, Frequency translation, Gain, Attenuation and decibels, Applications of Electronics Communication

UNIT – II

Analog and Digital Modulation Techniques: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT – III

Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.

Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN

UNIT – IV

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing

Unit – V

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, Zig Bee and Mesh Wireless networks, WiMAX and MANs, Infrared wireless, RFID communication, UWB.

TEXT BOOKS:

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. Electronic Communications systems, Kennedy, Davis 4e, MC GRAW HILL EDUCATION, 1999

REFERENCE BOOKS:

1. Theodore Rapp port, Wireless Communications - Principles and practice, Prentice Hall, 2002.
2. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
3. Introduction to data communications and networking, Wayne Tomasi, Pearson Education, 2005.

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IV Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC7PC25) MICROWAVE ENGINEERING

Course Objectives: This is a core course in Microwave Communications domain, and covers contents related to Microwave Theory and Techniques. The main objectives of the course are

1. To get familiarized with microwave frequency bands, their applications and to Understand the characteristics of rectangular waveguides and microstrip lines.
2. To understand the limitations and losses of conventional tubes at microwave frequencies and Analyse different types of microwave tubes, their structures, principles of microwave power generation, and to characterize their performance features and applications.
3. To study different types of waveguide components and ferrite devices, to impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions.
4. To study microwave solid state devices and to understand the concepts of microwave measurements, identify the equipment required and precautions to be taken, and get familiarized with the methods of measurement of microwave power and various other microwave parameters.

Course outcomes: Upon completing this course, the student will be able to

1. Apply the concepts of Maxwell's equations and derive performance characteristics of rectangular wave guides and cavity resonators.
2. Demonstrate types, structures and characteristics of microwave tubes.
3. Analyse structure and operational characteristics of Helix and M-type tubes
4. Select various waveguide components for different microwave applications and Evaluate their S-parameters.
5. Construct test bench using microwave tubes and solid-state devices to measure various signal characteristics.

UNIT-I

Microwave Transmission Lines - I: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Power Transmission, Impossibility of TEM Mode. Illustrative Problems, Micro strip Lines– Introduction, Z_o Relations, Effective Dielectric Constant.

Cavity Resonators– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

UNIT II

Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics, Illustrative Problems.

UNIT-III

Helix TWTs: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

M-Type Tubes: Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation,

Separation of PI-Mode, o/p characteristics, Illustrative Problems

UNIT IV

Waveguide Components and Applications: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator, Circulator.

Scattering Matrix– Significance, Formulation and Properties, S Matrix Calculations for – Waveguide Multiport Junctions E plane and H plane Tees, Magic Tee, Directional Couplers – 2 Hole, Bethe Hole types, Circulator Illustrative Problems

UNIT V

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Introduction to Avalanche Transit Time Devices.

Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers. Measurement of Attenuation, Frequency. Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q, Impedance Measurements

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IV Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**2**

(20SM7MS02) FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS

Course Objectives: To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

Course outcomes: Upon completing this course, the student will be able to

1. Apply various managerial approaches to learn managerial skills.
2. Use creativity and innovation in managerial work
3. Differentiate the principles of organization.
4. Evaluate motivational theory
5. Develop effective controls

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: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Production Planning and Control. 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 HRM: 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: Job Satisfaction, Job Enrichment, Job Enlargement, Talent Management, Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT- IV:

Leading 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 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

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

TEXT BOOKS:

1. Management Essentials, Andrew Du Brin, 9e, Cengage Learning, 2012.
2. 2.Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

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IV Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
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(20EC7PC26) MICROWAVE ENGINEERING LAB

Course Objectives:

1. The goal of this course is to introduce students to the concepts and principles of the advanced
2. microwave engineering.
3. To understand the operation of different types of Microwave sources.

Course outcomes:

1. calculate the performance characteristics of microwave tube
2. sketch square wave modulation by applying Gunn diode characteristics.
3. Analyse the scattering parameter for various microwave junction.
4. Evaluate different parameter of a waveguide.
5. Investigate radiation pattern of Horn antenna.

Note: Minimum of 12 experiments to be conducted

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement.
5. Square wave modulation using Gunn diode.
6. Measurement of Waveguide Parameters.
7. Impedance Measurement.
8. Measurement of Scattering Parameters of a E plane Tee
9. Measurement of Scattering Parameters of a H plane Tee
10. Measurement of Scattering Parameters of a Magic Tee
11. Measurement of Scattering Parameters of a Circulator
12. Attenuation Measurement
13. Frequency Measurement.
14. Antenna Pattern Measurements.

Equipment & Components Required:

1. Gunn diode
2. Klystron power supply
3. Klystron mount
4. Isolator
5. Frequency meter
6. Variable attenuator
7. Slotted section
8. Tunable Probe
9. Detector mount
10. Matched termination
11. VSWR meter
12. waveguide stands
13. Magic tee
14. Directional coupler
15. Circulator
16. E-plane tee
17. H-plane tee
18. Horn Antenna
19. Parabolic Reflector

20. Gunn power supply
21 Pin modulator

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(20EC7PE31) Digital Image Processing
(Professional Elective – III)

Course Objectives:

1. To comprehend the relation between human visual system and machine perception and processing of digital images
2. To provide a detailed approach towards image processing applications like enhancement, segmentation and compression.

Course outcomes: Upon completing this course, the student will be able to

1. Apply different mathematical transforms on digital image.
2. Use spatial and frequency domain concepts for image enhancement.
3. Analyse different image restoration techniques and color image processing
4. Explain various image segmentation and morphological image processing.
5. Elaborate different image compression techniques.

UNIT – I

Digital Image Fundamentals &Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.

Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Aar Transform, Slant Transform, Hotelling Transform.

UNIT – II

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

Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Lowpass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT – III

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation.

UNIT- IV:

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation.

Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition,

Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation

UNIT- V

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG2000 Standards.

TEXT BOOKS:

1. Digital Image Processing --RafaelC. Gonzalez, RichardE.Woods,3rdEdition, Pearson,2008
2. Digital Image Processing-S Jayaraman, S Esakkirajan, T Veerakumar-MC GRAWHILL EDUCATION,2010

REFERENCEBOOKS:

1. DigitalImageProcessingandAnalysis-HumanandComputerVisionApplicationwithusingCVIPTools- ScotteUmbaugh, 2ndEd, CRCPress,2011.
2. Digital Image Processing using MATLAB – RafaelC. Gonzalez, Richard EWoods and StevenL. Eddings, 2ndEdition, MCGRAWHILLEDUCATION,2010.
3. Digital Image Processing and Computer Vision–Somka, Hlavac,Boyle-Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions-Adrian low, 2008,2ndEdition.

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IV Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
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(20EC7PE32) WIRELESS SENSOR NETWORKS
(Professional Elective – III)

Prerequisite: Analogue and Digital Communications

Course Objectives:

1. To acquire the knowledge about various architectures and applications of Sensor Networks
2. To understand issues, challenges and emerging technologies for wireless sensor networks
3. To learn about various routing protocols and MAC Protocols
4. To understand various data gathering and data dissemination methods
5. To Study about design principals, node architectures, hardware and software required for implementation of wireless sensor networks

Course outcomes: Upon completing this course, the student will be able to

1. Choose Wireless Sensor Networks for various scenarios considering their constraints and challenges
2. Utilize MANETS and enabling technologies for wireless sensor networks optimally
3. Explain routing, MAC, LR-WPAN and ZigBee protocols
4. Analyse data dissemination, gathering and fusion etc., in a
5. Develop Wireless Sensor Network for different applications considering various design principles and constraints

UNIT – I

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT – II

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT – III

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

UNIT- IV:

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion, Quality of a sensor network; Real-time traffic support and security protocols

UNIT- V

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints

TEXT BOOKS:

1. Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy. S. Manoj, Pearson
2. 2. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE

REFERENCEBOOKS:

1. Wireless Digital Communications – Kamil Feher, 1999, PHI.
2. 2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. 3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.
4. 4. Wireless Communication and Networking – William Stallings, 2003, PHI

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(20EC7PE33) NEURAL NETWORKS AND APPLICATIONS
(Professional Elective – III)

Course Objectives:

1. To understand the biological neural network and to model equivalent neuron models.
2. To understand the architecture, learning algorithm and issues of various feed forwardand feedback neural networks.

Course outcomes: By completing this course the student will be able to:

1. Create different neural networks of various architectures both feed forward and feed backward.
2. Perform the training of neural networks using various learning rules.
3. Perform the testing of neural networks and do the perform analysis of these networksfor various pattern recognition applications.
4. Evaluate different Mapping Models
5. Design NeuroDynamical Models and **Hopfield Models**

UNIT - I

Introduction: 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: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT - II

Single Layer Perceptron's: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT - III

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT - IV

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT - V

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, NeuroDynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm

Hopfield Models – Hopfield Models, Computer Experiment

TEXT BOOKS:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCEBOOKS:

1. Artificial Neural Networks - B. Venkataramana Prentice Hall of India P Ltd 2005
2. Neural Networks in Computer Intelligence, Li Min Fu MC GRAW HILLEDUCATION 2003
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing HouseEd. 2006.

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(20EC7PE41) SATELLITE COMMUNICATIONS
(Professional Elective – IV

Course Objectives:

1. To acquired foundation in orbital mechanics and launch vehicles for the satellites.
2. To provide basic knowledge of link design of satellite.
3. To understand multiple access systems and earth station technology
4. To understand the concepts of satellite navigation and GPS.

Course outcomes: Upon completing this course, the student will be able to:

1. Demonstrate the basic concepts of satellite Communication, and orbital mechanics involved in satellites and launchers
2. Discuss various sub systems in satellite Communication
3. Analyse satellite links and distinguish different multiple access techniques
4. Evaluate different stages involved earth station of satellite communication
5. Discuss the concepts of LEO, GEO Satellite Navigation and GPS

UNIT - I

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.
Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance

UNIT - II

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT - III

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design of Satellite Links for Specified C/N, System Design Examples.
Multiple Access: Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA On board Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT - IV

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT - V

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational Constellation Designs.
Satellite Navigation & Global Positioning System: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal

Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCEBOOKS:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
3. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
4. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004

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(20EC7PE42) SPEECH PROCESSING
(Professional Elective – IV

Pre-requisite: Engineering Mathematics, Basics of Signals and System

Course outcomes: At the end of the course, students will demonstrate the ability to:

1. Use the concepts of the speech production and hearing models, furthermore mathematically model the speech signal.
2. Apply models for speech and audio signal processing.
3. Analyse the quality and properties of speech signal.
4. Evaluate speech recognition techniques.
5. Design text to speech synthesis techniques.

UNIT - I

Introduction - Computers and audio, Digital audio, Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid; Requirements of speech codecs –quality, coding delays, robustness.

Speech Signal Processing - Types of speech, Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

UNIT - II

Linear Prediction of Speech - Basic concepts of linear prediction; Linear Prediction Analysis of non-stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction. LPC model of speech production, Structures of LPC encoders and decoders;

UNIT - III

Speech Quantization - Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Pitch models, Vector quantization – distortion measures, codebook design, codebook types, CELP speech production model.

UNIT - IV

Speaker Recognition - Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-gram, context dependent sub-word units; Applications and present status.

UNIT - V

Speech Synthesis - Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

TEXT BOOKS & REFERENCEBOOKS

1. Speech and Audio Processing" by Ian Vince McLoughlin: A MATLAB-based Approach, Cambridge University Press.
2. Lawrence Rabinerand Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.
3. Daniel Jurafsky and James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education.
4. B. Gold, N. Morgan, D. Ellis, Speech and Audio Signal Processing: Processing and Perception of Speech and Music, Wiley-Blackwell.
5. T. Dutoit, F. Marqués, L.R. Rabiner, Applied signal processing: a MATLAB-based Proof of Concept, Springer.

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IV Year B.Tech. ECE – I Sem	**L**	**T**	**P**	**C**
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(20EC7PE43) BIO MEDICAL ELECTRONICS
(Professional Elective – IV

Course Objectives

1. Identify significant biological variables at cellular level and ways to acquire different bio-signals.
2. Elucidate the methods to monitor the activity of the heart, brain, eyes and muscles.
3. Introduce therapeutic equipment for intensive and critical care.
4. Outline medical imaging techniques and equipment for certain diagnosis and therapies

Course outcomes: After completion of the course the student is able to:

1. Apply Bio potential signals and their characteristics in different types of Electrodes.
2. Utilize various electrodes and recording Cardiovascular measurement.
3. Analyse working principles of various Neurological Instruments.
4. Evaluate different critical care equipment.
5. Discuss the principles of Instruments in medical imaging.

UNIT - I

Bio-Potential Signals and Electrodes: Bio-signals and their characteristics, Organization of cell, Nernst equation of membrane, Resting and Action potentials. Bio-amplifiers, characteristics of medical instruments, problems encountered with measurements from living systems. Bio-potential electrodes –Body surface recording electrodes, Internal electrodes, micro electrodes. Bio-chemical transducers –reference electrode, the pH electrodes, Blood gas electrodes. Electrode theory, selection criteria of electrodes & different types of electrodes such as, Ag – Ag Cl, pH, etc.

UNIT - II

Cardiovascular Instrumentation: Heart and cardiovascular system Heart electrical activity, blood pressure and heart sounds. Cardiovascular measurements electro cardiography – electrocardiogram, ECG Amplifier, Electrodes and leads, ECG recorder principles. Types of ECG recorders. Principles of blood pressure and blood flow measurement. Phonocardiography, Ballis to cardiography, Cardiac pacemaker – defibrillator –different types and its selection

UNIT - III

Neurological Instrumentation: Neuronal communication, electro encephalogram (EEG), Remeasurements EEG electrode-placement system, interpretation of EEG, EEG system Block diagram, preamplifiers and amplifiers. EMG block diagram and Stimulators. Bed side monitor –block diagram- measuring parameters-cardiac tachometer-Alarms-Lead fault indicator-central monitoring. Telemetry – modulation systems – choice of carrier frequency – single channel telemetry systems.

UNIT - IV

Equipment for Critical Care: Therapeutic equipment - Pacemaker, Defibrillator, Shortwave diathermy, Hemodialysis machine. Respiratory Instrumentation - Mechanism of respiration, Spirometry, Pneumotachograph, Ventilators, Measurement of pH value of Blood-blood cell counting, blood flow, Respiratory transducers and instruments.

UNIT - V

Principles of Medical Imaging: Radiography, computed Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Medicine, Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET), Ultrasonography, Introduction to Telemedicine, Planar X-ray Imaging

TEXT BOOKS:

1. Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003.
2 Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.
3 J J Carr, "Introduction to Biomedical Equipment Technology": Pearson Education 4th e/d.

REFERENCEBOOKS:

1. Biomedical Instrumentation and Measurements – by Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer, PHI.
2. Principles of Applied Biomedical Instrumentation – by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
3. Introduction to Biomedical equipment technology-by Joseph Carr and Brown.
4. K S Kandpur, "Hand book of Biomedical instrumentation", Tata McGraw Hill 2nd e/d.
5. John G Webster, "Medical Instrumentation application and design", John Wiley 3rd e/d.
6. Richard Aston, "Principle of Biomedical Instrumentation and Measurement

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(20EC7OE21) FUNDAMENTALS OF SIGNAL PROCESSING
(Open Elective – II)

Prerequisites: The minimal suggested prerequisites for the course are a background of advanced calculus, along with a good understanding of the elements of complex numbers and variables. An exposure to linear system theory for continuous-time signals, including Laplace and Fourier transforms is helpful, but not required

Course Objectives

1. Introduce the different types of signals and systems.
2. Identify how to apply the mathematics in engineering.
3. Elucidate the DFT by FFT method and different algorithms used in signal processing.
4. Outline of digital filters and multirate signal processing techniques.

Course outcomes: After completion of the course the student is able to:

1. Illustrate discrete time signals and systems based on its characteristics.
2. Manipulate the signal by using discrete Fourier transform, FFT.
3. Analyse Discrete Time Infinite Impulse Response filter with the help of various methods.
4. Evaluate Discrete Time Finite Impulse Response filter with the help of various methods.
5. Organize decimation, interpolation and sampling rate conversion in multi rate signal processing

UNIT - I

Discrete Time Signals, Systems: Discrete time signals & discrete time systems, time response & frequency response analysis of Discrete Time Linear time invariant Systems, Discrete time systems described by difference equations. Convolution of Discrete Time Signals and sequences.

Discrete Fourier Series: DFS Representation of periodic sequences and Properties of Discrete Fourier Series.

UNIT - II

Introduction to DSP: Introduction, Frequency-domain Sampling, DFT, IDFT, DFT as a Linear Transformation (Matrix formulation), Properties of DFT: Periodicity, Linearity, Circular Time shifting, Circular Frequency Shifting, Circular Time Reversal, Conjugation and Conjugate Symmetry (Symmetry properties), Duality, Circular Convolution (Multiplication of two DFTs), Circular correlation, Multiplication (or Modulation) property, Parseval ‘s Relation.

UNIT - III

DFT and FFT: Use of DFT in linear filtering, linear convolution of two finite duration sequences, overlap add and save methods. Relation between DFT and other transforms. Direct computation of DFT. Necessity for efficient computation of DFT. Radix 2 Fast Fourier Transform (FFT) algorithm for DFT computation. Decimation in time algorithm, decimation in frequency algorithms. Radix 2 FFT algorithm for computation of Inverse Discrete Fourier Transform. (IDFT).

UNIT - IV

Introduction to realization of digital systems: Introduction, block diagrams representation, Realization of Infinite Impulse Response (IIR)systems: parallel form, cascade form. Introduction to IIR filters, Pole zero placement method for simple IIR Filters, Impulse invariant& Bilinear Transformations, Design of analog Butterworth and Chebyshev filters, Design of Digital Butterworth and Chebyshev filters.

UNIT - V

FIR and IIR Filter Design: Realization of Finite Impulse Response (FIR) systems, Direct Form, Linear Phase Form. Introduction to FIR filters, Frequency response of ideal digital low pass filter, high pass filter, Frequency sampling technique of designing FIR filters, Windowing design of FIR filters using Rectangular, Triangular & Hamming windows.

TEXT BOOKS:

1. Discrete-Time Signal Processing, Alan V. Oppenheim and Ronald W. Schafer, PrenticeHall, 2009.
2 Digital Signal Processing, Principles, Algorithms and Applications, John G. Proakis, Dimitris K Manolakis, Pearson education/PHI, (4th Edition).
3 Digital Signal Processing, Tarun Kumar Rawat, Oxford University Press (16 December 2014)

REFERENCEBOOKS:

1. Fundamentals of Digital Signal Processing, Lonnie Ludeman, John Wiley &Sons; Wiley International 1st Edition, 1988.
2 Discrete-Time Signal Processing, Alan V. Oppenheim, Ronald W. Schafer, John R. Buck, Prentice-Hall Signal Processing Series, 2nd Edition, 1999
3. Understanding Digital Signal Processing, Richard G. Lyons Prentice Hall, March 25, 2nd Edition 2004
4. Digital Signal Processing: Fundamentals and Applications, Li Tan, Academic Press, 1st edition 2007
5. Schaum's Outline of Digital Signal Processing, Monson Hayes, McGraw- Hill, 1st edition, 1998

E Books:

1. https://www.amazon.in/Digital-Signal-Processing-Tarun-Kumar/dp/0198081936
2. https://www.amazon.com/Digital-Signal-Processing-John-Proakis/dp/0131873741

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(20EC8PE51) IoT and Its APPLICATIONS
(Professional Elective – V)

Course Objectives

1. To study the fundamentals about IoT
2. To study about IoT Access technologies
3. To study the design methodology and different IoT hardware platforms.
4. To study the basics of IoT Data Analytics and supporting services.
5. To study about various IoT case studies and industrial applications

Course outcomes: At the end of this course, students will be able to

1. Identify the basics of IoT.
2. Implement the state of the Architecture of an IoT.
3. Design methodology and hardware platforms involved in IoT.
4. Analyse and organize the data for cloud platform.
5. Compare IOT Applications in Industrial & real world.

UNIT - I

FUNDAMENTALS OF IoT- Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoT WF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT - II

IoT PROTOCOLS- IoT Access Technologies: Physical and MAC layers, topologyand Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT.

UNIT - III

DESIGN AND DEVELOPMENT- Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks

IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT - IV

DATA ANALYTICS AND SUPPORTING SERVICES:

Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M,

Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

UNIT - V

CASE STUDIES/INDUSTRIAL APPLICATIONS: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment's, Industry 4.0 concepts.

TEXT BOOKS:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
2 Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, UniversitiesPress, 2015
3 Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education

REFERENCEBOOKS:

1. The Internet of Things – Key applications and Protocols, Olivier Her sent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2 "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Ho¨ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Aves and. David Boyle and Elsevier, 2014.
3. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer,2011.
4. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, Michael Margolis, Arduino Cookbook and O'Reilly Media,2011.

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(20EC8PE52) NETWORK SECURITY AND CRYPTOGRAPHY
(Professional Elective – V)

Course Objectives

1. Understand the basic concept of Cryptography and Network Security, their mathematical models
2. To understand the necessity of network security, threats/vulnerabilities to networks and countermeasures
3. To understand Authentication functions with Message Authentication Codes and Hash Functions.
4. To provide familiarity in Intrusion detection and Firewall Design Principles

Course outcomes: Upon completing this course, the student will be able to

1. Outline the network security fundamental concepts and principles.
2. Demonstrate the encryption and decryption of messages using block ciphers & protocols.
3. Analyse key agreement algorithms and its weaknesses.
4. Assess different types of threats, malware, spyware, viruses, vulnerabilities.
5. Identify various network security applications, IP Sec, Firewall, IDS, Web security, Email security, and Malicious software etc.

UNIT - I

Security Services, Mechanisms and Attacks, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.
Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT - II

Encryption: Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block Ciphers. Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT - III

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.
Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT - IV

Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.
Hash and Mac Algorithms: MD-5, Message digest Algorithm, Secure Hash Algorithm.
Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.
Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, SIME/MIME.

UNIT - V

IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure

Electronic Transaction.

Intruders, Viruses and Worms: Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2 Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH,2004

REFERENCEBOOKS:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2 Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
3. Principles of Information Security, Whitman, Thomson.
4. Introduction to Cryptography, Buchmann, Springer.

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(20EC8PE53) RADAR SYSTEMS
(Professional Elective – V)

This course needs the knowledge of Signal and Systems, EM Theory and Transmission Lines, Antennas and Wave Propagation, and Microwave Engineering. The main objectives of this course are:

Course Objectives

1. To explore the concepts of radar and its frequency bands.
2. To understand Doppler effect and get acquainted with the working principles of CW radar, FM-CW radar.
3. To impart the knowledge of functioning of MTI and Tracking Radars.
4. To explain the designing of Radar Receivers

Course outcomes: Having gone through this course on Radar Systems, the students would be able to:

1. Interpret various parameters of RADAR using its basics.
2. Demonstrate continuous wave and frequency modulated RADAR.
3. Analyse Moving target indicator and pulse Doppler RADAR.
4. Compare different types of Tracking Radars.
5. Develop RADAR receivers and phased array antennas.

UNIT - I

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

Radar Equation: SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets , Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT - II

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

UNIT - III

MTI and Pulse Doppler radar: Introduction, Principle, 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. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT - IV

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparisonof Trackers.

UNIT - V

Radar Receivers – Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, MC GRAW HILL EDUCATIONSpecial Indian Edition, 2nd Ed., 2007.

REFERENCEBOOKS:

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2 Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee,2013
4. Introduction to Radar Systems, 3rd edition – M.I. Skolnik, MC GRAW HILLEDUCATION Ed., 2005

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(20EC8PE61) Optical Communications
(Professional Elective – VI)

Course Objectives

1. To realize the significance of optical fiber communications.
2. To understand the construction and characteristics of optical fiber cable.
3. To develop the knowledge of optical signal sources and power launching.
4. To identify and understand the operation of various optical detectors.
5. To understand the design of optical systems and WDM.

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

1. Illustrate the features of optical fibers, interpret the parameters and types of single mode fibers
2. Demonstrate signal distortions in optical fibers
3. Explain fiber splicing, optical sources and source to fiber power launching
4. Evaluate various stages of optical detectors
5. Construct an optical communication system for given design parameters**.**

UNIT - I

Overview of Optical Fiber Communication: Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes number, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

UNIT - II

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay,Typesof 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.
Source to Fiber Power Launching: - Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

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- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

UNIT - V

Optical System 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. Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, MC GRAW HILL EDUCATION, 4th Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition,2009.

REFERENCEBOOKS:

1. Fiber Optic Communications – D.K. Mynbaev S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2 Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI,2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Edition, 2004
4. Introduction to Fiber Optics by Donald J.Sterling Jr. – Cengage learning, 2004.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC8PE62) ARTIFICIAL INTELLIGENCE

(Professional Elective – VI)

Course Objectives

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning

Course outcomes

1. Ability to formulate an efficient problem space, expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
4. Apply AI techniques to solve problems of game playing, and machine learning.
5. Acquire the knowledge on machine learning techniques.

UNIT - I

Problem Solving by Search-I: Introduction to AI, Intelligent Agents

Problem Solving by Search –II: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment.

UNIT - II

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT - IV

Planning

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT - V

Uncertain knowledge and Learning

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOKS:

1. Artificial Intelligence a Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCEBOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2 Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC8PE63) GLOBAL POSITIONING SYSTEM

(Professional Elective – VI)

Course Objectives

1. Study different types of GPS Signal Characteristics.
2. Understand the Receiver design and Different types of Errors.
3. understand GEO Uplink subsystem, GEO downlink system.
4. Understand Precision approach Aircraft landing system, Military and Space application

Course outcomes: Upon completing this course, the student will be able to

identify GPS components and their functions.

1. Study different types of GPS Signal Characteristics.
2. Understand the Receiver design and Different types of Errors.
3. understand and GEO Uplink subsystem, GEO downlink system.
4. Understand Precision approach Aircraft landing system, Military and Space application

UNIT - I

Introduction: Basic concept, system architecture, GPS and GLONASS Overview, Satellite Navigation, Time and GPS, User position and velocity calculations, GPS, Satellite Constellation, Operation Segment, User receiving Equipment, Space Segment Phased development, GPS aided Geotargeted navigation (GAGAN) architecture.

UNIT - II

Signal Characteristics: GPS signal components, purpose, properties and power level, signal acquisition and tracking, Navigation information extraction, pseudo range estimation, frequency estimation, GPS satellite position calculation, Signal structure, anti-spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT - III

GPS Receivers & Data Errors: Receiver Architecture, receiver design options, Antenna design, GPS error sources, SA errors, propagation errors, ionospheric error, tropospheric error, multipath, ionospheric error, estimation using dual frequency GPS receiver, Methods of multipath mitigation, Ephemeris data errors, clock errors.

UNIT - IV

Differential GPS: Introduction, LADGPS, WADGPS, Wide Area Augmentation systems, GEO Uplink subsystem, GEO downlink systems, Geo Orbit determination, Geometric analysis, covariance analysis, GPS /INS Integration Architectures.

UNIT - V

GPS Applications: GPS in surveying, Mapping and Geographical Information System, Precision approach Aircraft landing system, Military and Space application, intelligent transportation system.

GPS orbital parameters, description of receiver independent exchange format (RINEX) , Observation data and navigation message data parameters, GPS position determination, least squares method

TEXT BOOKS:

1. Mohinder S. Grewal, Lawrence R. Weill, Angus P. Andrews, "Global positioning systems, Inertial Navigation and Integration", Wiley 2007.

REFERENCEBOOKS:

1. E.D. Kaplan, Christopher J. Hegarty, "Understanding GPS Principles and Applications", Artech House Boston 2005.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. ECE – II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EC8OE31) Electronic Measuring Instruments

(Open Elective – III)

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives

1. It provides an understanding of various measuring system functioning and metrics for performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments viz.signal generators, signal Analyses, recorders and measuring equipment.
3. Understanding the concepts of various measuring bridges and their balancing conditions.

Course outcomes: Upon completing this course, the student will be able to

1. Calculate the Electrical parameters for different meters
2. Modify the signals by using signal generators and Analyses
3. Analyse signals using different Cathode Ray Oscilloscopes
4. Measure the Force, Resistance, Temperature, etc., using transducers
5. Formulate the procedures of measuring physical parameters

UNIT - I

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT - II

Signal Analyse rs: AF, HF Wave Analyse rs, Harmonic Distortion, Heterodyne wave Analyse rs, Spectrum Analyse rs, Power Analyse rs, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT - III

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT - IV

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchro's, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

UNIT - V

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture,

TEXT BOOKS:

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D.Cooper: PHI 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

REFERENCEBOOKS:

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpat Rai& Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
3. Industrial Instrumentation: T.R. Padmanabham Springer 2009.
4. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.

Program Educational Objectives (PEO's):

PEO1: The students of the program will have strong foundation in the fundamental principles and gain advanced knowledge in the Basic Sciences, Mathematics and other application of Advanced Computer Engineering.

PEO2: The students of the program will be prepared for their successful careers in the software industry / seek higher studies and continue to develop.

PEO3: The students of the program will prepare to engage in professional development through self-study, graduate and professional studies in engineering & business.

PEO4: Graduates shall have good communication skills, leadership skills, professional, ethical and social responsibilities.

Programme Outcomes (PO's) :

PO1. Engineering knowledge: Ability to obtain and apply the knowledge of science and engineering essentials in problem solving.

PO2. Problem Analysis: Ability to undertake problem recognition ,formulation and providing ideal solution.

PO3. Design/ development of solutions: An ability to design, implement a computer based system, with desire program to meet the needs of social and environmental considerations.

PO4. Conduct investigations of complex problems: An ability to apply mathematical formulas, algorithmic principles and computational theory to develop a model and design of computer based system.

PO5. Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PO6. Engineer and society: An ability to analyze the impact of computing in different organizations, society including the varying policy issues that are taken care off.

PO7. Environment and sustainability: Understanding of impact of engineering solutions on the environment and this attains sustainability with responsibility.

PO8.Ethics: An ability to lead a strong professionalism and the ethical values.

PO9. Individual and team work: An ability to function effectively on multidisciplinary environments leads to leadership and member of team work.

PO10. Communication: An ability to communicate effectively in both verbal and written form which enables to prepare well documentation for report writing and a project.

PO11. Project management and finance: Apply project management practices to the launch of new programs, initiatives, products, services, and events relative to the stakeholder needs including – finance.

PO12. Life-long learning: Recognition of the need for higher studies and inspires to update the latest technologies by the way of life long learning process from time to time.

Program Specific Outcomes: (PSO's):

PSO1: Demonstrate proficiency in use of software and hardware required to practice electronics and communication profession

PSO2: To exhibit the ability to design and develop complex systems in the areas of IoT based Embedded Systems, Advanced Signal and Image Processing.

Institutes Under

TKR EDUCATIONAL SOCIETY

Teegala Krishna Reddy Engineering College(TKEM)

TKR College of Engineering and Technology(TKRC)

TKR Institute of Management and Science(TKRB)

TKR College of Pharmacy(TKRP)