TEEGALA KRISHNA REDDY ENGINEERINGCOLLEGE

(AUTONOMOUS)
Accredited by National Board of Accreditation (NBA) & NAAC 'A' GRADE

SYLLABUS BOOK

FOR

B.TECH

ELECTRONICS AND COMMUNICATION ENGINEERING

R20 REGULATIONS

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TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(Autonomous)

ACADEMIC REGULATIONS FOR B.TECH R20 (REGULATIONS)

APPLICABLE FOR REGULAR STUDENTS OF B.TECH. WITH EFFECT FROM THE ACADEMIC YEAR 2020.

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

1.1 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) at its Autonomous College with effect from the academic year 2020- 21 in the various branches of Engineering which college offers:

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 Telangana 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 fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech. 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 chosen specialization/branch	18*
06	Open Electives-Electives from other technical and/or emerging 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 (1/3of 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 CGPAof 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 $\geq$ 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 basedon 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 by satisfying 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 supplementary examinations, whether the student takes those examinations or not.
3.	III Semester to IV Semester	Regular course of study of III semester, by satisfying attendance requirements.
4.	IV Semester to V Semester	Regular course of study of IV semester, by satisfying attendance requirements, and must have secured at least credits i.e., 60% credits up to IV semester from the offered credits (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, by satisfying 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 offered credits from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 7 | VII Semester to VIII Semester | Regular course of study of VII Semester, by satisfying 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 the near 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 by satisfying attendance requirements.
04	VI semester to VII Semester	Regular course of study of VI Semester by satisfying academic requirements and a minimum of 60% of credits (rounding to the near low value) from the offered credits, from two regular and two supplementary examinations of III Semester; two regular and 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 by satisfying 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 $\geq$ 5.0 (in each semester) and CGPA (at the end of each successive semester $\geq$ 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 to 15 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-valuation 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 10 marks and internal practical examination will be assessed for 15 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 thecollege 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 (10 marks for day-to-day evaluation and 15 marks for internal examination) and 75 marks for semester end examination. **There shallbe 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 ($\sum$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

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

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), C_i is the no. of credits allotted to the ith subject, and G_i 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

$$\{\sum_{j=1}^{M} C_j G_j\} / \{\sum_{j=1}^{M} C_j \text{ for all semester registered}\} \text{ (i.e., up to and inclusive of S semesters, S ≥ 2),}$$

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), c_j is the no. of credits allotted to the jth subject, and G_j represents the grade point (GP) corresponding to the letter grade awarded for that j^{th} 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:

Course/subject	Credits	Letter Grade	Grade points	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
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	1.5	B+	7	1.5 x 7 = 10.5
	Total Credits = 38.5			Total Credit Points = 301.5

CGPA = 301.5/38.5 = 7.83

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 $\geq$ 5 ('C' grade or above) in every subject/course in that semester (i.e. when student gets an SGPA $\geq$ 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 $\geq$ 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

12.0   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 $\geq$ 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) $\geq$ 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 $\geq$ 8.00,** for each year of course study.

- Students with final CGPA (at the end of the under graduate Program) $\geq$ **6.50 but <8.00**, shall be placed in '**first class**'.
- Students with final CGPA (at the end of the under graduate Program) $\geq$ **5.50 but<6.50,** shall be placed in '**second class**'.
- Students with final CGPA (at the end of the under graduate Program) $\geq$ **5.00 but <5.50,** and all other students who qualify for the award of degree (as per 12.1) with **final CGPA $\geq$ 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 $\geq$ 8.00** consistently in all semesters will be eligible to compete for the awards of '**rank**' and '**gold medal**'.

13.0   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/substitutesubjects 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 ofthe 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 witheffect 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 (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of 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 imposter is 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 cancellation of performance in that subject and all the 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 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 seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that 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 to his person or to any of his relations whether by words, either spoken or written or by	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 shall not 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.

	signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the 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 for two consecutive semesters from class work and all end examinations. The continuation of the course 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 of the performance in that 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.
9.	Indulges in any malpractice or improper conduct 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 examination hall and cancellation of the Performance in that 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 of the performance in that 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.
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 all other 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 be reported to the PRINCIPAL/DIRECTOR for further action to award suitable punishment.	

INSTITUTE VISION AND MISSION

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 OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION AND MISSION

VISION

Striving to provide quality education and train students in the interdisciplinary technologies to meet the needs and demands of the society, shaping them into skilful engineers imbibed with professionalethics in the field of Electronics and Communication Engineering.

MISSION

- Imparting quality education in Electronics and Communication Engineering through effectiveteaching –learning process and make the students useful to the Society.

- Involving the students in creative and group activities.

- Empowering the students to prepare them for technicality, employability and entrepreneurshipcapabilities with social etiquettes.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO 1: The students will be supported with a solid foundation in Basic Sciences and Mathematics. These basics will be used extensively in Electronics and Communication Engineering for solving practical problems.

PEO 2: The students will be trained to acquire practical skills and hands on experience which motivates them to participate in National and International festivals, seminars, workshops and also industrial visits. Added to the above, they are exposed to gain employability, entrepreneurship and face competitive examinations.

PEO 3: The students will acquire with life skills so that they can envisage the problems and portray solutions enabling them to work effectively with group and develop confidence to face group discussions.

PEO 4: The students shall also exhibit professionalism, ethical attitude and communication skills intheir chosen profession and update their skills to latest technologies through lifelong learning process.

PROGRAMME OUTCOMES (PO's)

Engineering Graduates will be able to:

PO.1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO.2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO.3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO.4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO.5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO.6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO.7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO.8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO.9. Individual and team work: Function effectively as an individual, and as a member or leaderin diverse teams, and in multidisciplinary settings.

PO.10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clearinstructions.

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

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

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO 1: Students able to acquire creativity in support of the design, simulation, implementation towards the basic technologies in the field of Electronics and Communication Engineering.

PSO 2: An able to recognize the importance of professional developments in the field of Electronics and Communication Engineering and achieve success in the competitive examinations, further develop interest towards higher studies and career building.

COURSE STRUCTURE (2020-21)
B.Tech - I SEMESTER (R20)

S. No.	Course Code	Course Title	L	T	P	Credits
1	20MA1BS01	Mathematics-1	3	1	0	4
2	20CS1ES01	Programming For Problem Solving	3	1	0	4
3	20ME1ES02	Engineering Graphics	1	0	4	3
4	20AP1BS02	Applied Physics	3	1	0	4
5	20CS1ES03	Programming For Problem Sovling Lab	0	0	3	1.5
6	20AP1BS03	Applied Physics Lab	0	0	3	1.5
7	20MC1ES04	Environmental Science	3	0	0	0
		Total Credits	**13**	**3**	**10**	**18**

B.Tech - II SEMESTER (R20)

S. No.	Course Code	CourseTitle	L	T	P	Credits
1	20MA2BS04	Mathematics-II	3	1	0	4
2	20CH2BS05	Engineering Chemistry	3	1	0	4
3	20 EE2ES05	Basic Electrical Engineering	3	0	0	3
4	20EN2HS01	English	2	0	0	2
5	20ME2ES06	Engineering Workshop	1	0	3	2.5
6	20CH2BS06	Engineering Chemistry Lab	0	0	3	1.5
7	20EN2 HS02	English Language And Communication skillsLab	0	0	2	1
8	20EE2ES07	Basic Electrical Engineering Lab	0	0	2	1
		Total Credits	**12**	**2**	**10**	**19**

B.Tech - III SEMESTER (R20)

S. No.	CourseCode	CourseTitle	L	T	P	Credits
1	20EC3PC01	Electronic Devices And Circuits	3	1	0	4
2	20EC3PC02	Network Analysis and Transmission Lines	3	0	0	3
3	20EC3PC03	Switching Theory and Logic Design	3	1	0	4
4	20EC3PC04	Signals and Systems	3	1	0	4
5	20EC3ES08	Probability Theory and Stochastic Processes	3	0	0	3
6	20EC3PC05	Electronic Devices and Circuits Lab	0	0	2	1
7	20 EC3PC06	Switching Theory and Logic Design Lab	0	0	2	1
8	20EC3ES09	Basic simulation lab	0	0	2	1
9	20MC3HS03	Professional Ethics in Engineering	3	0	0	0
10	20MC3HS04	Quantitative analysis	3	0	0	0
		Total Credits	**21**	**3**	**6**	**21**

B.Tech - IV SEMESTER (R20)

S. No.	Course Code	CourseTitle	L	T	P	Credits
1	20EC4PC07	Analog and Digital Communications	3	1	0	4
2	20EC4PC08	Electromagnetic Fields And Waves	3	0	0	3
3	20EC4PC09	Analog and Pulse Circuits	3	0	0	3
4	20MA4BS07	Numerical Methods &Complex Variables	3	1	0	3
5	20EC4PC10	Linear IC Applications	3	0	0	3
6	20EC4PC11	Analog And Digital Communications Lab	0	0	3	1.5
7	20EC4PC12	Analog and Pulse Circuits Lab	0	0	3	1.5
8	20EC4PC13	IC Applications Lab	0	0	2	1
9	20MC4HS05	Gender Sensitization Lab	3	0	0	0
10	20MC4HS06	Logical Reasoning	3	0	0	0
		Total Credits	**21**	**2**	**8**	**20**

B.Tech - V SEMESTER (R20)

S. No.	Course Code	CourseTitle	L	T	P	Credits
1	20SM5MS01	Business Economics & Financial Analysis	3	0	0	3
2	20EC5PC14	Antenna and Wave Propagation	3	1	0	4
3	20EC5PC15	Python for IoT	3	0	0	3
4	20EC5PC16	Microprocessors & Microcontrollers	3	1	0	4
5		Professional Elective - I	3	0	0	3
6	20EC5PC17	Antenna Simulation Lab	0	0	2	1
7	20EC5PC18	Python Programming Lab	0	0	3	1.5
8	20EC5PC19	Microprocessors & Microcontrollers Lab	0	0	3	1.5
9	20MC5HS07	Intellectual Property Rights	3	0	0	0
10	20MC5HS08	Personality Development and Soft Skills	2	0	0	0
11	20EC5PW01	Summer Internship	0	0	0	1
		Total Credits	**20**	**2**	**8**	**22**

B.Tech - VI SEMESTER (R20)

S. No.	CourseCode	Course Title	L	T	P	Credits
1	20EC6PC20	Control Systems	3	1	0	4
2	20EC6PC21	Digital Signal Processing	3	1	0	4
3	20EC6PC22	VLSI Design	3	1	0	4
4		Professional Elective - II	3	0	0	3
5		Open Elective – I	3	0	0	3
6	20EC6PC23	Digital Signal Processing Lab	0	0	3	1.5
7	20EC6PC24	e – CAD Lab	0	0	3	1.5
8	20EN6HS09	Advanced Communication Skills Lab	0	0	2	1
9	20MC6HS10	Basic Technical Training	3	0	0	0
		Total Credits	**18**	**3**	**8**	**22**

B.Tech - VII SEMESTER (R20)

S. No.	Course Code	CourseTitle	L	T	P	Credits
1	20EC7PC25	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	Management Fundamentals for Engineers	2	0	0	2
6	20EC7PC26	Microwave Engineering Lab	0	0	2	1
7	20EC7PW02	Industrial Oriented Mini Project/ Summer Internship	0	0	0	2
8	20EC7PC27	Comprehensive Exam	0	0	0	1
9	20EC7PC28	Seminar	0	0	2	1
10	20EC8PW03	Project Stage – I	0	0	6	3
		Total Credits	**14**	**0**	**10**	**22**

B.Tech - VIII SEMESTER (R20)

S. No.	Course Code	Course Title	L	T	P	Credits
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 Credits	**9**	**0**	**14**	**16**

Professional Elective – I

S. No	Subject Code	Subject Name
01	20EC5PE11	Computer Organization & Operating Systems
02	20EC5PE12	Object Oriented Programming through Java
03	20EC6PE13	Data Analytics

Professional Elective – II

S. No	Subject Code	Subject Name
01	20EC6PE21	Data Communications and Networks
02	20EC5PE22	Cellular and Mobile Communications
03	20EC6PE23	Embedded System Design

Professional Elective – III

S. No	Subject Code	Subject Name
01	20EC7PE31	Wireless Sensor Networks
02	20EC7PE32	Digital Image Processing
03	20EC7PE33	Neural Networks & Applications

Professional Elective – IV

S. No	Subject Code	Subject Name
01	20EC7PE41	Satellite Communications
02	20EC7PE42	Speech and Audio Processing
03	20EC7PE43	Bio-Medical Electronics

Professional Elective – V

S. No	Subject Code	Subject Name
01	20EC8PE51	Network Security and Cryptography
02	20EC8PE52	Radar Systems
03	20EC8PE53	IoT and its Applications

Professional Elective – VI

S. No	Subject Code	Subject Name
01	20EC8PE61	Fiber Optic Communications
02	20EC8PE62	Global Positioning System
03	20EC8PE63	Artificial Intelligence

Open Elective – I

20EC6OE11	Principles of Electronic Communications

Open Elective – II

20EC7OE21	Fundamentals of signal processing

Open Elective – III

20EC8OE31	Electronic Measuring Instruments

MATHEMATICS – I
(Common for CE, CSE, IT, EEE, ECE)

Course: B.Tech **Semester I** **L T P C**

Course Code: 20MA1BS01 **3 1 0 4**

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. Represent 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. Analyse the nature of sequence and series.
4. Apply the mean value theorems.
5. Find 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, 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.

TEXT BOOKS
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.

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

PROGRAMMING FOR PROBLEM SOLVING

Course: B.Tech.   **Semester I**   **L   T   P   C**

Course Code: 20CS1ES01   **3   1   0   4**

Course Objectives:
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 will learn
1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs

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, goto, Iteration with for, while, do-while loops I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout 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.

TEXT BOOKS:
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
2. Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
4. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
5. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

ENGINEERING GRAPHICS

Course: B.Tech.   **Semester I**   **L   T   P   C**

Course Code: 20ME1ES02   **1   0   4   3**

Course objectives: The objectives of the course are

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

1. Draw lines, curves and show dimensions as per BIS standards.
2. Find the position of an object in any one of the four quadrants with respect to observer, object and the reference planes and to construct the projections for points, lines and planes.
3. Apply the principles of projections to the solids and also draw their sectional views and true shape of sections.
4. Grasp the knowledge and draw the development of surfaces and intersections in real time situations**.**
5. Develop and visualize 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
ORTHOGRAPHIC PROJECTIONS: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III
Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT – IV
Development of Surfaces of Right Regular Solids – 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 Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions
INTRODUCTION TO CAD: (For Internal Evaluation Weightage only): Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package

TEXTBOOKS:

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

REFERENCE BOOKS:

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

APPLIED PHYSICS

Course: B.Tech.   **Semester I**   **L T P C**

Course Code: 20MA1BS02   **3 1 0 4**

Course Objectives: The objectives of this course,

1. To apply the theoretical knowledge of Physics through hands on experimental instruments

2. To understand the basic need of experiments.

3. To know how to measure the different physical quantities.

4. To gain the knowledge about different electrical components and basic electrical circuits

Course Outcomes: After learning the contents of the syllabus

1. The student gain knowledge on fundamentals of modern physics and quantum mechanics, and utilize the knowledge in various applications

2. The student can able to learn fundamentals of Semiconductor physics, enable to apply to various systems like communications, photo cells and so on.

3. The student understands concepts of optoelectronic devices and applies their knowledge inapplications like LED, Solar cell.

4. The students will learn the new advancement in engineering field like lasers and fiber optics and their applications

5. The student can learn basics of Electromagnetism and various magnetic properties and their applications in engineering.

Unit - I: Quantum Mechanics

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

Unit - II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

Unit - III: Optoelectronics

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

Unit - IV: Lasers and Fibre Optics

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres

Unit - V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials

Text Books:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learing.
2. Halliday and Resnick, Physics - Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

References:

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL

PROGRAMMING FOR PROBLEM SOLVING LAB

Course: B.Tech.   **Semester I**   **L T   P   C**

Course Code: 20CS1ES03   **0   0   3   1.5**

Course Objectives: The students will learn the following:
1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze 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 candidate is expected to be able to:
1. Formulate The Algorithms For Simple Problems.
2. Correct Syntax Errors As Reported By The Compilers.
3. Identify And Correct Logical Errors Encountered During Execution.
4. Represent And Manipulate Data With Arrays, Strings And Structures.
5. Create, read and write to and from simple text and binary files.

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 functions 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.

f. Write a program for display values reverse order from array using pointer.

g. Write a program through pointer variable to sum of n elements from 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:
   i. To insert a sub-string in to a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.

d. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

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

f. 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 actionto 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 ofintegers 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

APPLIED PHYSICS LAB

Course: B.Tech　　　　　　　　　　**Semester I**　　　　　　　**L T P C**

Course Code: 20AP1BS03　　　　　　　　　　　　　　　　　**0 0 3 1.5**

Course Outcomes:

1. The student will be able to learn about the energy gap of semiconductor and working of solar cell.
2. The student can able to study the characteristics of LED and variation of magnetic field with electricfield.
3. The student can compare the theory of Hall effect and corelate with experiment to determine Hallcoeffient.
4. Student will be able to draw the LASER characteristics and able to find the losses in the optical fibrecables.
5. Student will understand the usage of basic electronic components like resistor, capacitor, and inductorand can use them for engineering applications.

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. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric 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.

References:

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)

2. Engineering physics practicals by Dr.B. Srinivasa Rao, V.K.V. Krishna.K.S.Rudramamba

ENVIRONMENTAL SCIENCE

Course: B.Tech **Semester I** **L T P C**

Course Code: : 20MC1ES04 **3 0 0 0**

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:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in sustainable development.
The students should be able to:

1. Develop an understanding of ecological perspective and the value of the environment.
2. Understand 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, Discover effective methods of waste management and come out with best possible solutions.
5. Raise 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, ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** 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

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

REFERENCE BOOKS:
1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL 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.

MATHEMATICS – II

Course: B.Tech   **Semester II**   **L   T   P   C**

Course Code: 20MA2BS04   **3   1   0   4**

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 paper the student must be able to
1. Identify and solve different types of ordinary differential equations of first order.
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Evaluate the multiple integrals and apply the concept to find areas, volumes
4. Evaluate the centre of mass and gravity for cubes, sphere and rectangular parallelepiped.
5. Evaluate 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, $e(x)$ 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 (withoutproofs) and their applications.

TEXT BOOKS

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.

REFERENCES

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

ENGINEERING CHEMISTRY

Course: B.Tech   **Semester II**   **L   T   P   C**

Course Code: 20CH2BS05   **3   1   0   4**

Course Objectives:

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to becomea 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 understandingreaction pathways

Course Outcomes:

At the end of the course, the students will gain:

1. The knowledge of atomic and molecular orbital, band theory related to conductivity of materials.
2. To understand the basic properties of water and its usage in domestic and industrial purposes.
3. The knowledge of electrochemistry and Corrosion which are essential for the engineers in industry.
4. To understand the Organic reaction mechanisms and getting a basic concept of common drugsviz. Paracetamol and Aspirin.
5. The required skills to get clear concepts in basic spectroscopic methods and their application forengineering materials.

UNIT-I: Molecular structure and Theories of Bonding

Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2 and 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 colour properties. Band structure of solids and effect of doping on conductance.N-doping, P-doping.

UNIT-II: Water and its treatment

Introduction – hardness of water – Causes of hardness . Types of hardness: temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water –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-III: 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-IV: 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. Markownikoff and anti Markownikoff's additions.Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and CrO_3.

Reduction reactions: Reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$.Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

UNIT-V: 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$\equiv$N, C=C and C$\equiv$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.

TEXT BOOKS:

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. Volhardtand N.E.Schore, 5th Edition.

BASIC ELECTRICAL ENGINEERING

Course: B.Tech   **Semester II**   **L   T   P   C**

Course Code: 20 EE2ES05   **3   0   0   3**

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. To analyze and solve electrical circuits using basic network laws and theorems.
2. To understand and analyze basic Electric AC Circuits and effect of resonance.
3. To study the working and operation of Transformers and its applications.
4. To study the working principles of Electrical Machines of both AC and DC
5. To introduce components of Components of LT Switch gear 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 wave forms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L- C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

Unit-III Transformers

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

Unit-IV Electrical Machines

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

Unit-V Electrical Installations

Components of LT Switch gear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wiresand 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 McGrawHill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

REFERENCES:

1. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall, India,1989.
4. Circuit Theory Analysis and Synthesis, AbhijitChakrabarti, DhanpatRai& Co, 2016.

ENGLISH

Course: B.Tech   **Semester II**   **L T P C**

Course Code: 20EN2HS01   **2 0 0 2**

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 andpractical components of English syllabus.
3. Develop study skills and communication skills in formal and informal situations.

Course Outcomes:

Students should 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. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Prepare themselves to interact in English in their future careers.

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 andSubject-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 ofRequisition, Job Application with Resume.

Unit-III
'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University 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

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 usageGrammar: 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.

REFERENCES:

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 Blackswan, Pvt.,Ltd, 2014

ENGINEERING WORKSHOP

Course: B.Tech　　　　　　　　**Semester II**　　　　　　　　**L　T　P　C**

Course Code: 20ME2ES06　　　　　　　　　　　　　　**1　0　0　2**

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, equipments and processes those are common in the engineering field.

4. To develop a right attitude, team working, precision and safety at work place.

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, measuringequipment and to work to prescribed tolerances.

Course Outcomes: At the end of the course, the student will be able to:
 Study and practice on machine tools and their operations

1. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
2. Practice on manufacturing of components using workshop trades including Tin smithy, Black smithy.
3. Identify and 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. Apply basic electrical engineering knowledge for house wiring practice

1. **TRADES FOR EXERCISES:**
   At least two exercises from each trade:

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

   ii. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)

   iii. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)

   iv. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)

v. Welding Practice – (Arc Welding & Gas Welding)

vi. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)

vii. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

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

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

REFERENCE BOOKS:
1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

ENGINEERING CHEMISTRY LAB

Course: B.Tech   **Semester II**   **L   T   P   C**

Course Code: 20ME2ES06   **0   0   3 1.5**

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.
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 skills on:

1. An ability to gain knowledge about different types of qualitative and quantitative estimation.
2. An ability to analyze the quality of water by determining its chemical parameters.
3. To acquire the skill for the preparation of common drugs like Paracetamol and Aspirin.
4. Estimation of rate constant of a reaction from concentration – timerelationships.
5. Determination of physical properties like adsorption andviscosity of lubricants.

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 catalysed 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.

REFERENCES
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

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course: B.Tech   **Semester II**   **L   T   P   C**

Course Code: 20EN2HS02   **0   0   2   1**

Course Objectives:

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:

1. Better understanding of nuances of English language through audio- visual experience and groupactivities.
2. Neutralization of accent for intelligibility by overcoming mother tongue influence.
3. Develop the skill of using appropriate language in various speaking contexts.
4. Understand how to use language to make formal presentations.
5. Speaking skills with clarity and confidence which in turn enhances their interpersonal skills.

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.

EXERCISE – II

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms inContext.

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 andSeeking Permissions - Telephone Etiquette.

EXERCISE – IIICALL 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.Practice: Formal Presentations.

EXERCISE – 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.

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 SkillsLab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech. First English)

REFERENCES:
1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. Speaking English Effectively 2 nd 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 Blackswan. Hyderabad.
6. Hewings, 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. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan) Cambridge: CUP

BASIC ELECTRICAL ENGINEERING LAB

Course : B.Tech   **Semester - II**   **L T P C**

Course Code: 20EE2ES07   **0 0 2 1**

Course Objectives:
1. To analyze 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 analyze the performance characteristics of DC and AC electrical machines

Course outcomes:
1. Get a clear cut understanding about basic electrical laws.
2. Understand the response of different types of electrical circuits to different excitations.
3. Understand the response electrical circuits under resonance condition.
4. Understand the measurement, calculation and relation between the basic electrical parameters
5. To perform and understand 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 PhaseTransformer
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

ELECTRONIC DEVICES AND CIRCUITS

Course   : B.Tech.   **Semester III**   **L   T   P   C**

Course Code: 20EC3PC01   **3   1   0   4**

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.   Know the characteristics of various components.
2.   Understand the utilization of components and about sampling gates.
3.   Understand the Construction, Operation and Characteristics of BJT and its biasing.
4.   Understand the Construction, Operation and Characteristics of FET and its biasing .
5.   Ability to gain the idea of MOSFET to know the structure by considering the factors in application of determining Digital and Analog Circuits.

Unit-I

Diode and Special Purpose Devices : Diode - Static and Dynamic resistances, Equivalent circuit, 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 .

TEXT BOOKS:
1. Electronic Devices and Circuits- Jacob Millman, McGraw Hill Education
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson**.**

REFERENCES:
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.

NETWORK ANALYSIS AND TRANSMISSION LINES

Course : B.Tech   **Semester III**   **L T P C**

Course Code: 20EC3PC02   **3 0 0 3**

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. Gain the knowledge on basic RLC circuits behavior.
2. Analyze the Steady state and transient analysis of RLC circuits
3. Apply the characteristics of two port network parameters.
4. Analyze the transmission line parameters.
5. Analyze the behavior of transmission line for different lengths and to apply 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, Impedance transformation 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. $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

TEXTBOOKS:
1. Network Analysis – Van Valkenburg, 3rd Ed., Pearson, 2016.
2. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.
3. Electric Circuits – J. Edminister and M. Nahvi – Schaum's Outlines, Mc Graw Hills Education, 1999.

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

SWITCHING THEORY AND LOGIC DESIGN

Course   : B.Tech   **Semester III**   **L   T   P   C**

Course Code: 20EC3PC03   **3   1   0   4**

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 in the design of digital systems.

3. To understand the concepts of combinational logic circuits and sequential circuits.

Course outcomes:

1. Understand the numerical information in different forms and Boolean Algebra theorems

2. Postulates of Boolean algebra and to minimize combinational functions

3. Design and analyze combinational and sequential circuits

4. Analyze, design and implement Sequential Logic Circuits

5. Ability to create state diagram for sequential logical circuits and implement of a finite state machine

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.

TEXT BOOKS:

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

REFERENCES:

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

SIGNALS AND SYSTEMS

Course : B.Tech   **Semester III**   **L T P C**

Course Code: 20EC3PC04   **3 1 0 4**

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:

1. Understand the concepts of types of signals and systems with their representation.Evaluate signal in terms of mutually orthogonal functions.
2. Represent an arbitrary signal in time and frequency domain applying Fourier series and Fourier transform techniques.
3. Apply the concepts of Signal transmission through linear time invariant (LTI) systems forgiven System.
4. Apply the concepts of Laplace transform and Z-Transform to know system parameters like causality, stability, response of system.
5. Analyze the concepts of sampling theorem, convolution and correlation of signal for a given specifications of the system.

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.

REFERENCES:
1. Signals and Systems – Simon Haykin 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.

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course : B.Tech **Semester III** **L T P C**

Course Code: 20EC3ES08 **3 0 0 3**

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

Course outcomes:
1. Able to compute the sample probability and expectation from probability density functions likeGaussian Poisson etc.
2. Understand the concept of moment's characteristic function and inequalities and apply on a givensingle and multiple random variables.
3. Understand the concept of Poisson and Gaussian random processes and determine the covariance fora given random process.
4. Apply the concept of random process to determine the spectral density of a given stationary randomprocess.
5. Understand the concepts of noise sources and determine the noise in a given communication system.

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 for a 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 of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

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.

REFERENCES:
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 Agencies3 rd 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.

ELECTRONIC DEVICES AND CIRCUITS LAB

Course : B.Tech   **Semester III**   **L   T   P   C**

Course Code: 20EC3PC05   **0   0   2   1**

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:
1. Analyze the characteristics of different practical diodes.

2. Construct electronic circuits for various applications using diodes and transistors.

3. Analyze the characteristics of different Transistor configurations.

4. Study of Sampling Gates and Design of different types of Clippers and Clampers.

5. Analyze the behavior of JFET which can be used in the design of Amplifier

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

SWITCHING THEORY AND LOGIC DESIGN LAB

Course : B.Tech	Semester III	L	T	P	C
Course Code: 20EC3PC06		0	0	2	1

Course Objectives:

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

Course outcomes: Upon completion of the Course, the students will be able to:
At the end of this course, students will demonstrate the ability to

- Understand working of logic families and logic gates.
- Design and implement Combinational logic circuits.
- Design and implement Sequential logic circuits.
- Design and implement Asynchronous and Synchronous counters
- Design and implement shift registers, sequence detector.

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.

BASIC SIMULATION LAB

Course : B.Tech   **Semester III**   **L T   P C**

Course Code: 20EC3ES09   **0 0   2 1**

Course Objectives:

- 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.
- To determine the Fourier Transform of signals and to convert a continuous time signal to discrete and reconstruction using Sampling theorem.
- To apply convolution and correlation for continuous time signal.
- To use Laplace and Z transforms for analyzing continuous /discrete time signals and systems

Course outcomes:

- Analyze signal characteristics utilizing time shifting, scaling, folding and amplitude scaling.
- Apply the concept of correlation and convolution for given signals and sequences.
- Apply the concept of wiener-Khinchine relations for given signal.
- Analyze the given system for time shifting and time reversal properties of Fourier transform.
- Analyze High pass and Low pass filter frequency response using suitabletransformtechniques.

LIST OF EXPERIMENTS

1. Basic Operations on Matrices.

2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, UnitStep, 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 the given 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

PROFESSIONAL ETHICS IN ENGINEERING

Course : B.Tech	Semester III	L	T	P	C
Course Code: 20MC3HS03		0	0	2	1

Course Objective:

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

Course Outcome:

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

UNIT – I:

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

UNIT – II:

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

UNIT – III:

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

UNIT – IV:

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

UNIT – V:
Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

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

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

QUANTITATIVE APTITUDE
(Common for CE, EEE, ECE, CSE, IT)

Course : B.Tech   **Semester III**   **L T   P C**

Course Code: 20MC3HS04   **3   0   0 0**

Course Objectives: The Students learn
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.

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

REFERENCES
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

ANALOG AND DIGITAL COMMUNICATIONS

Course   : B.Tech   **Semester IV**   **L   T   P   C**

Course Code: 20EC4PC07   **3   1   0   4**

Course Objectives:
1. To develop ability to analyze 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 completing this course, the student will be able to
1. Distinguish between different amplitude modulation schemes with their advantages, disadvantages and applications.
2. Identify the various elements in Angle Modulation and able to apply them for a givensystem.
3. Attain the knowledge of various blocks required for the design of AM, FM transmittersand receivers.
4. Able to apply different waveform coding techniques to a specified Digital Communication System.
5. Understand the concept of Error Control Codes and capable of solving a given problemusingany of the digital modulation techniques.

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, Comparision 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 Companding, 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.

TEXT BOOKS:

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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ELECTROMAGNETIC FIELDS AND WAVES

Course : B.Tech   **Semester IV**   **L T P C**

Course Code: 20EC4PC08   **3 0 0 3**

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 solutionsto communication engineering problems.
3. To analyze 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. Get the knowledge of Basic Electrostatics Laws, Concepts and proofs related to ElectrostaticFields.
2. Get the knowledge of Magnetostatic Fields.
3. Distinguish between the static and time-varying fields, establish the corresponding sets ofMaxwell's Equations and Boundary Conditions.
4. Analyze the Wave Equations for good conductors, good dielectrics and evaluate the UPW Characteristics for several practical media of interest.
5. Analyze the reflection and transmission coefficients for UPW propagation, distinguish betweenBrewster and Critical Angles.

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.

TEXT BOOKS:
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.

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

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ANALOG AND PULSE CIRCUITS

Course : B.Tech　　　　　　**Semester IV**　　　　　　　**L　T　P　C**

Course Code: 20EC4PC09　　　　　　　　　　　　　　**3　0　0　3**

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 andpositive feedback
4. To construct various sweep circuits using transistors

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

1. Design the single stage and multistage amplifiers and understand the concepts of Low Frequency Analysis of Transistors.
2. Design the JFET Amplifiers and understand the concepts of High Frequency Analysis of Transistors.
3. Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations
4. Design and realize different classes of Power Amplifiers and tuned amplifiers usable foraudio and Radio applications.
5. Design of 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 Amplifiers,CE amplifier 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, JFETAmplifiers, Comparison of performance with BJT Amplifiers.

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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, Astable Multivibrators and Schmitt trigger using Transistors.

Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Pulse synchronization of Astable Multivibrator.

TEXT BOOKS:
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 Mothiki S 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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NUMERICAL METHODS AND COMPLEX VARIABLES
(Common to ECE & EEE)

Course: B.Tech **Semester IV** **L T P C**

Course Code: 20MA4BS04 **3 1 0 3**

Course Objectives: To learn
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. Find the root of a given equation.
2. Estimate the value for the given data using interpolation.
3. Find the numerical solutions for a given ODE's.
4. Analyze the complex function with reference to their analyticity, integration using Cauchy's integraland residue theorems.
5. Taylor's and Laurent's series expansions of complex Function.
6. Apply 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.

TEXT BOOKS
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.

REFERENCES
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.

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LINEAR IC APPLICATIONS

Course   : B.Tech   **Semester IV**   **L T P C**

Course Code: 20EC4PC10   **3   0   0   3**

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. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and applications of IC 555 and IC 565
3. Acquire the knowledge about the Data converters.
4. Understand the fundamentals and areas of applications for the integrated circuits.
5. Understand Active filters and Oscillators design using operational amplifier.

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, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

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Unit-V

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 - parallel comparator type ADC, counter type ADC, successive approximation ADC dual slope integration type ADC, DAC and ADC specifications.

TEXT BOOKS:

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

REFERENCES 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

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ANALOG AND DIGITAL COMMUNICATIONS LAB

Course : B.Tech.   **Semester IV**   **L   T   P   C**

Course Code: 20EC4PC11   **0   0   3   1.5**

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
Analyze the spectrum of various Analog Modulation techniques.
Generate Multiplexing and De-multiplexing signals in Frequency and Time domain.
Examine various Waveform Coding techniques.
Analyze different digital modulation and demodulation schemes.
Simulate Analog and Digital modulation techniques using signal processing tool

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 Equipments required for Laboratories:
1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
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.

ANALOG AND PULSE CIRCUITS LAB

Course: B.Tech **Semester IV**

Course Code: 20EC4PC12

L	T	P	C
0	0	3	1.5

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, analyze 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. Design and Analyze the frequency response of different types of Amplifier circuits
2. Design and Analyze the different types of Oscillator circuits
3. Design and study the characteristics of Power Amplifiers
4. Design and analyze the Multivibrators.
5. Design sweep circuits for various applications.

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

Hardware Testing in Laboratory:
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 Equipments 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

IC APPLICATIONS LAB

Course   : B.Tech. II Year   **Semester IV**   **L   T   P   C**

Course Code: 20EC4PC13   **0   0   2   1**

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. Design analog circuits for practical applications using Op Amp IC-741
2. Attain the knowledge of functional diagrams and applications of IC 555 and IC 565
3. Acquire the knowledge about the Data converters.
4. Understand the fundamentals and areas of applications for the integrated circuits.
5. Understand Active filters and Oscillators design using operational amplifier.

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 Equipments 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.

GENDER SENSITIZATION LAB

Course : B.Tech   **Semester IV**   **L   T   P   C**

Course Code: 20MC4HS05   **3   0   0   0**

     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 programmes combating gender- based violence and discrimination. The course also features several exercises and reflective activitiesdesigned 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. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals. Students will develop a sense of appreciation of women in all walks of life.
5. 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.

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Unit - I
Understanding Gender
Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudestowards 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
Gender - Based Violence
The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a HumanRights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping withEveryday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. RebuildingLives. 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 PopularLiterature-Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender andPopular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. RosaParks- The Brave Heart.

 TEXTBOOK
"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 Akad

Logical Reasoning

Course: B.Tech **Semester IV** **L T P C**

Course Code: 20MC4HS06 **3 0 0 0**

Course Objectives: The students learn
1. To improve the Logical Ability and Reasoning skills among the students to meet the expectations ofIndustry.
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.

TEXT BOOKS
1. R.S. Aggarwal, A Modern Approach to Logical Reasoning.
2. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning.

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