**VIDYA JYOTHI INSTITUTE OF TECHNOLOGY**

**An Autonomous Institution**

**Aziznagar Gate, C.B. Post, Hyderabad – 500075, Telangana, India.**


# B.Tech Syllabus (R-18)

# ACADEMIC REGULATIONS (R18)
## Definitions of Key Words

**Academic Year**: An academic year is referred as the period consisting of two consecutive semesters with 16 weeks each of instructional period followed by both the semester exams.

**Course:** A plan of study of a particular subject leading to an examination. All the courses need not carry the same weight. A course may be designed to comprise of lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/ vocational training/ viva/ seminars/ assignments/ presentations etc. or a combination of some of these.

**Choice Based Credit System (CBCS):** Choice Based Credit System (CBCS) is the program in which the students have a choice to choose from the prescribed courses and can learn at their own pace and the entire assessment is graded-based on a credit system.

**Credit Point:** It is the product of Grade Point and Number of Credits for a course.

**Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/ field work per week.

**Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student of all the semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to 2nd decimal place.

**Grade Point:** It is a numerical weight allotted to each letter Grade on a 10-point scale.

**Letter Grade**: It is an index of the performance of students in a said course.
Grades are denoted by letters O, A+, A, B+, B, C, P and F.
**Programme:** An Educational Programme leading to the award of a Degree.

**Semester:** Each semester will consist of 16-18 weeks of academic work equivalent to 90 actual teaching days.

**Semester Grade Point Average (SGPA):** It is a measure of performance of the work done by the student in a semester. It is the ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to 2nd decimal place.

**Transcript or Grade Card or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

**Types of Courses:** The Courses in under B. Tech, program may be of three kinds' viz., Core, Elective and Mandatory.

**a) Core Course:**

There may be a Core Course in every semester and are to be compulsorily studied by a student and is essential requirement for a given Programme.

**b) Elective Course:**

Elective Course is a course which can be chosen by the students from a pool of subjects. In general, the elective course is,

- Supportive to the discipline of study
- Providing an expanded scope of the course subjects
- Nurturing student's proficiency/skill.
- In case an elective is "Discipline centric" and is offered by the student's department itself, the elective is called **Professional elective**.
- On the other hand, if the elective is offered by the other departments or if the choice is given to the students to choose from other disciplines, the elective is called an "**Open Elective**."

**c) Mandatory Courses (Non-Credit Courses)**

AICTE considers that the Course work of certain subjects is essential and as such for the award of a B.Tech degree a pass in these subjects is made mandatory. Therefore, such types of courses are referred as **mandatory courses**. As the AICTE also feels that only a familiarity with the subject content of these courses is essential, only a pass in each of these courses is required. Therefore, these subjects are included in the curriculum as non-Credit courses.

## ACADEMIC REGULATIONS FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2020-21 onwards.

**1. Courses of Study:**

The following Four-year Bachelor of Technology (B.Tech.) Programs under Choice Based Credit System (CBCS) are offered with effect from the Academic Year 2018-19 onwards:

| S. No. | Branch | Branch Code |
|---|---|---|
| I | Civil Engineering | 01 |
| II | Electrical and Electronics Engineering | 02 |
| III | Mechanical Engineering | 03 |
| IV | Electronics and Communication | 04 |
| V | Computer Science and Engineering | 05 |
| VI | Information Technology | 12 |

**2. Admission Procedure**

2.1. Admissions will be done as per the norms prescribed by the Government of Telangana State.

2.2. The Government orders with regard to the admissions in vogue shall prevail.

2.3. The candidate should have passed the prescribed qualifying examination on the date of Admission.

**3. Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he/she fulfills the following academic requirements:

3.1 The candidate shall register for 160 credits and secure all the 160 credits by securing a minimum CGPA of 5.0.

3.2 The external examination in all the subjects shall be conducted at the end of each semester for all the eight semesters.

3.3 Students joining the B.Tech. Programme shall have to complete the programme within 8 years from the year of joining. Similarly, the students joining the B.Tech. Programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the programme within 6 years from the year of joining otherwise they shall forfeit they will not be permitted to pursue their studies nor will be allowed to write the exams.

**4. Program details:**

4.1 The course shall be of four Academic year's duration, each academic year having two semesters. Each semester shall have a minimum **16** weeks of instruction, with a minimum of **90** Instructional Days per Semester.

4.2 **Credits:**

Credits shall be assigned to each Subject/ Courses with symbols L: T: P: C, where L stands for Lecture Period, T for Tutorial Period, P for Practical Period, C for Credits and the details are given in the following Table;

| Type of course | | Clock hours/ week | | | |
|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** |
| Theory | 1) | 0 | - | - | 04 |
| | 2) | 0 | - | - | 03 |
| | 3) | 0 | - | - | 02 |
| Practical | | 0 | 0 | 1 | 0.5 |
| Drawing | 1) | 0 | 04 | - | 02 |
| | 2) | 0 | 02 | - | 01 |
| Mini project, Comprehensive Viva Voce Seminar, Major project | | **-** | **-** | **-** | **17** |

**5. Attendance Requirements**

5.1 A student is eligible to write the Semester End examinations only if he/ she acquire a minimum of 75% of attendance in aggregate of all the subjects/ Courses in that Semester.

5.2 Condonation for the shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on medical grounds with a documentary evidence approved by the Academic Committee.

5.3 A stipulated fee shall be payable towards condonation of attendance shortage.

5.4 Students, whose shortage of attendance is not condoned, are not eligible to write semester end examinations of that semester. Such students are detained and their registration for the examination stands cancelled.

5.5 A student detained due to shortage of attendance in a semester may seek re-admission into that semester, as and when offered, within four weeks from the date of the commencement of class work with the academic regulations of the batch into which he/ she gets admitted.

5.6 A student will be promoted to the next semester if he/ she satisfies the attendance requirement of the present semester.

5.7 For all mandatory, noncredit courses offered in a semester, a "Satisfactory Participation Certificate" shall be issued to the student, only after securing 75% attendance in such course. Letter Grade shall be allotted for these courses.

**The courses offered in 8 semesters spread over 4 years have been classified into 8 categories under Choice Base Credit System (CBCS)**

| S. No. | Subject Categories | No. of Credits |
|---|---|---|
| 1 | Humanities and Social Sciences including Management course | 11 |
| 2 | Basic Science Course | 26 |
| 3 | Engineering Science courses including workshop, drawing, basics of electrical/ mechanical/ computer etc.. | 24 |
| 4 | Professional core Courses (Theory) | 46 |
| 5 | Professional core Courses (Labs) | 09 |
| 6 | Professional Elective courses relevant to chosen specialization/ | 18 |
| 7 | Open Elective subjects – Elective from other emerging subjects | 09 |
| 8 | Project work, seminar and internship in industry or appropriate work place/academic and research institutions in India/Abroad | **10+3+2+2 = 17** |
| 9 | Mandatory Course (Environmental Science & Gender Sensitization) | Nil |
| **Total Number of credits** | | **160** |

**B. Tech Year wise distribution of credits under CBCS**

| S. No. | Year | Semester | Credits | Total |
|---|---|---|---|---|
| 1 | 1st Year | I | 18/20 | **38** |
| | | II | 20/18 | |
| 2 | 2nd Year | I | 20 | **40** |
| | | II | 20 | |
| 3 | 3rd Year | I | 21 | **42** |
| | | II | 21 | |
| 4 | 4th Year | I | 20 | **40** |
| | | II | 20 | |
| **Total No. of Credits** | | | | **160** |

**6. Promotion regulations**

6.1 A student shall be promoted from B.Tech., I Year to II Year only if he/she fulfils the academic requirements of securing 50% of total credits (19 credits out of 38 credits, up to I year II Semester), from all the examinations, whether or not the candidate takes the examinations.

6.2 A student shall be promoted from B.Tech., II Year to III Year only if he/she fulfils the academic requirement of securing 50% of total credits (39 out of 78 credits, up to II year II semester, from all the examinations, whether or not the candidate takes the examinations.

6.3 A student shall be promoted from B.Tech., III year to IV year only if he/she fulfils the academic requirement of securing 50% of total credits (60 out of 120 credits) up to III year II semester), from all the examinations, whether or not the candidate takes the examinations.

## 7. Minimum Academic Requirements

The following minimum academic requirements are to be satisfied in addition to the requirements mentioned under item no.5.

7.1 A student shall deemed to have satisfied the minimum academic requirements and has earned the credits allotted to each theory/ practical/ design/ drawing subject/ project and secured not less than 35% marks in Semester End Examination (SEE), and minimum 40% of marks in the sum total of the internal evaluation and Semester end examination taken together.

7.2 The student has to pass the failed courses by appearing the supplementary examinations as per the requirement for the award of degree.

7.3 A student shall register and put up minimum Attendance and earn all 160 Credits for the award of degree.

7.4 Student, who fails to earn 160 credits as indicated in the course structure within eight academic years from the year of his/her admission, shall forfeit the seat in B. Tech. course and admission stands cancelled.

7.5 When a student is detained due to shortage of attendance in any semester, no Grade allotments or SGPA/CGPA calculations will be done for that entire Semester in which a student got detained.

7.6 When a Student is detained due to lack of Credits in any year, he may be readmitted after fulfilment of the Academic Requirements, with the Academic Regulations of the Batch into which he gets readmitted. If there are any Professional Electives/ Open Electives, the same may also be re-registered if offered. However, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the same set of Elective Subjects offered under that category.

7.7 A student is eligible to appear in the End Semester Examination in any Subject/ Course, but absent at it or failed (thereby failing to secure P Grade or above), may reappear for that subject/ Course at the supplementary exam as and when the examinations are conducted. In such cases, his Continuous Internal Evaluation(CIE) assessed earlier for that subject/ Course will be carried over, and added to the marks to be obtained in the supplementary examinations, for evaluating the performance in that subject.

7.8 A student with a final CGPA (at the end of the UGP) < 5.00 will not be eligible for the Award of the Degree.

## 8 Evaluation - Distribution and weight age of Marks

8.1 The performance of a student in each semester shall be evaluated Subject-wise (irrespective of Credits assigned) for a maximum of 100 marks for Theory or Seminar or Drawing/Design or Industry Oriented Mini-Project or Minor Course, etc. For Practical's a maximum of 75 Marks shall be evaluated. However, B. Tech. Project work (Major Project) will be evaluated for 200 Marks. These evaluations shall be based on 25% CIE (Continuous Internal Evaluation) and 75% SEE (Semester End Examinations) and a Letter Grade corresponding to the % marks obtained shall be given.

8.2 For theory subjects the distribution shall be 25 marks for Continuous Internal Evaluation (CIE) and 75 marks for the Semester End- Examination (SEE).

8.3 For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination will be conducted for 20 marks and consists of Part-A (Short Answer Questions) for 6 marks and Part-B (Long Answer Questions) for 14 marks with duration of 90 Minutes. First midterm examination shall be conducted for 2.5 units of syllabus and second midterm Examination shall be conducted for remaining 2.5 units. The Average marks secured by a student in I and II Midterm examination are considered and shall be taken as the final marks secured by the student towards Continuous Internal Evaluation in the theory subject.

8.4 In case a few students are absent due to health reasons or any other unavoidable circumstances, or if the performance of some of the students is very poor, all such cases will be referred to a standing committee consisting of the Controller of examinations (Chairman), HoD of the concerned dept. and the Academic coordinator. On the recommendation of the committee, a makeup test will be conducted on payment of fee fixed by the examination branch.

8.5 In order to improve the attendance and to encourage the students who are regular to the college, 5 marks in each subject will be given to the students as per the percentage of attendance shown in the table,

Table: - Marks for attendance

| S. No | Percentage of attendance | Marks to be awarded |
|---|---|---|
| 1. | Less than 75% | nil |
| 2. | 75% to 80% | 3 |
| 3. | 80% to 85% | 4 |
| 4. | 85% and above | 5 |

8.6 The Semester End Examination will be conducted for 75 marks which consist of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks. Part-A is compulsory, which consists of ten questions (numbered from 1 to 10) two from each unit carrying 2/3 marks each. Part-B consists of five questions (numbered from 11 to 15) 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 (i.e., there will be two questions from each unit and the student should answer any one question).

8.7 For practical subjects there shall be a continuous evaluation during the Semester for 25 marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the concerned laboratory teacher.

8.8 The Practical End Semester Examination shall be conducted with an external examiner and the laboratory teacher for 50 marks. The external examiner shall be appointed by the Principal from the panel of examiners recommended by the Chairman, Board of Studies of respective departments.

8.9 For the subject having design and/ or drawing, (such as Engineering Graphics, Engineering Drawing, and Machine Drawing), the distribution shall be 25 marks for Internal Evaluation (5 marks for day-to-day work and 20 marks for internal tests) and 50 marks for Semester End Examination. There shall be one internal test in a semester and shall be considered for the award of marks for internal test.

8.10 There shall be an industry-oriented mini-Project, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated in IV year I Semester at the time of practical exams. The industry oriented mini project shall be submitted in report form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external examiner, Head of the department, the supervisor of mini project and a senior faculty member of the department. There shall be no internal marks for industry oriented mini project.

8.11 There shall be a seminar presentation in IV-year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, 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 50 marks. There shall be no external examination for the seminar.

8.12 There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a committee consisting of Head of the Department and two Senior Faculty members of the department and is evaluated for 100 marks. The Comprehensive Viva-Voce is intended to assess the students understanding of the subjects he studied during the B. Tech. course. There will be no External Examiner for the Comprehensive Viva-Voce.

8.13 Out of a total of 200 marks for the major project work, 50 marks shall be for Internal Evaluation and 150 marks for the End Semester evaluation. The End Semester evaluation (viva-voce) shall be conducted by committee. The committee consists of an external examiner, Head of the Department, the supervisor of project and a senior faculty member of the department. The topics for industry oriented mini project, seminar and project work shall be different from each other. The evaluation of project work shall be conducted at the end of the IV year II Semester. The internal evaluation shall be on the basis of two seminars given by each student on the topic of his project.

8.14 The Laboratory marks and the sessional marks awarded by the faculty are subject to scrutiny by the Institution whenever/wherever necessary. In such cases, the sessional and laboratory marks awarded by the teacher will be referred to a College Academic Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved as per the University rules and produced before the Committees of the University as and when asked for.

8.15 Candidates shall be permitted to apply for recounting/revaluation of SEE scripts within the stipulated period with payment of prescribed fee.

**9.0. Malpractice Rules**

| S. No. | Nature of Malpractices/ Improper conduct during examinations | Punishment |
|---|---|---|
| | If the candidate: | |
| 1 (a) | Possesses 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). | a) Expulsion from the examination of the performance in that subject only of all the candidates involved.<br>b) In case of an outside, he/she will be handed over to the police and a case is registered against him/ her. |
| (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. | |
| 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. | |
| 3 | Impersonates any other candidate in connection with the examination. | a) The candidate who has impersonated shall be expelled from examination hall.<br>b) The candidate is also debarred and forfeits the seat in the college.<br>c) The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/ year.<br>d) The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |

| | | |
|---|---|---|
| 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. | a) 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/year.<br>b) The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations.<br>c) The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5 | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass. | 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 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. | a) The concerned students will 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/year.<br>b) 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 is registered against them. |

| | | |
|---|---|---|
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | a) 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 & shall not be permitted for the remaining examinations of the subjects of that semester/year.<br><br>b) The candidate is also debarred for two consecutive semesters from class work and all Semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | |
| 8. | Possess any lethal weapon or firearm in the examination hall (or) if a student comes in a drunken condition to the examination hall. | |
| 9. | If a student of the college, who is not a candidate for the particular examination or any person not connected with the examination. | |
| 10. | If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the head of Institute for further action for a suitable punishment. | |

All the cases pertaining to malpractices in examinations will be referred to a committee constituted by the Chief Controller of Examination and the committee will suggest action as per the guidelines mentioned above.

**10. Grading Procedure:**

10.1. Marks will be awarded to indicate the performance of each student in each theory subject, or Lab/Practical, or Seminar, or Project, or Mini-Project, Minor Course etc., based on the % marks obtained in CIE+SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified, and a corresponding Letter Grade shall be given.

10.2. As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed.

| Letter Grade | Performance | Grade Points | % of marks Secured (Class Intervals) |
|---|---|---|---|
| O | | 10 | Greater than or equal to 90% |
| A+ | Excellent | 9 | 80% and less than 90% |
| A | Very Good | 8 | 70% and less than 80% |
| B+ | Good | 7 | 60% and less than 70% |
| B | Average | 6 | 50% and less than 60% |
| C | Pass | 5 | 40% and less than 50% |
| F | Fail | 0 | Below 40% |
| AB | Absent | 0 | Absent |

10.3. A student obtaining F Grade in any subject shall be considered 'Failed' and will be required to reappear as 'Supplementary Candidate' in the end Semester Examination (SEE), as and when offered. In such cases; his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

10.4. A Letter Grade does not imply any specific % of Marks.

10.5. In general, a student shall not be permitted to repeat any Subject/Course (s) only for the sake of Grade Improvement' or 'SGPA/ CGPA Improvement'. However, he has to repeat all the Subjects/Courses pertaining to that Semester, when he is detained.

10.6. A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ course. Credit Points (CP) = Grade Point (GP) x Credits for a Course.

10.7. The Student passes the Subject/ Course only when he gets GP $\geq$ 5 (P Grade or above).

**11. Registration/ Dropping**

11.1. Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the academic calendar. It is absolutely necessary for the student to register for courses in time.

11.2. A student at the end of III year I semester either having the CGP of $\geq$ 7.0 or having passed all previous courses in first attempt with a minimum CGPA $\geq$ 5.0 is allowed to register an additional theory course with the recommendations of the faculty advisor & HOD of the dept.

11.3. Departments will notify at the time of registration about the minimum number of students to be enrolled for a particular open elective to be offered.

11.4. Any student may be barred from registering for any course for specific reasons like disciplinary action or any other illegal activities carried out by a student, which is detrimental to the discipline of the college.

11.5. Dropping of Courses: Within four weeks after the commencement of the semester, the student may, in consultation with his / her faculty advisor, drop one or more courses without prejudice to the minimum number of credits. The dropped courses are not recorded in the Grade Card.

11.6. After Dropping, minimum credits registered shall be 20.

**12. Earning of Credits**

A student shall be considered to have completed a Course successfully and earned the credits if he/she secures an acceptable letter grade in the range 'O' to 'P'. Letter grade 'F' in any Course implies failure of the student in that Course and no credits earned.

**13. Passing Standards:**

13.1. A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA $\geq$ 5.00 (at the end of that particular Semester).

13.2. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those obtained earlier. In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

13.3. A Student shall be declared successful or 'passed' in any Non-Credit Subject/ Course, if he secures a 40% marks or **P** grade in the end sem. exam conducted by the college along with the other examinations.

13.4. 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, Grade Earned etc.), Credits earned, SGPA, and CGPA.

**14. Eligibility for the award of B.Tech. Degree**

A student shall be eligible for award of the B. Tech degree if he/she fulfils all the following Conditions:

14.1. The students should successfully complete all the components prescribed in the Programme of study to which he/ she is admitted.

14.2. The student should also obtain CGPA greater than or equal to 5.0.

14.3. Not having any pending disciplinary action.

**15. Evaluating of Grade Point Averages:**

15.1. SGPA and CGPA the *credit index* can be used further for calculating the Semester Grade Point Average *(SGPA)* and the Cumulative Grade Point Average *(CGPA)*, both of which being important performance indices of the student. While *SGPA* is equal to the *credit index* for a semester divided by the total number of *credits* registered by the student in that semester, *CGPA* gives the sum total of *credit indices* of all the previous semesters divided by the total number of *credits* registered in all these semesters. Thus, The Grade Point Average (GPA) will be calculated according to the formula:

Where Ci = number of credits for the course i, Gi = grade points obtained by the student in the course.

$$GPA = \frac{\sum CiGi}{\sum Ci}$$

15.2. Semester Grade Point Average (SGPA) is awarded to candidates considering all the courses of the semester. Zero grade points are also included in this computation. SGPA is rounded off to TWO Decimal Places.

SGPA will be computed as follows;

∑ [(Course *credits*) X (*Grade points*)] (for all Courses passed in that semester)

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∑ [(Course *credits*)] (for all courses registered in that semester).

15.3. To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time. CGPA is rounded off to TWO Decimal Places.

CGPA will be computed as follows:

∑ [(Course *credits*) X (*Grade points*)] (for all Courses passed up to that semester)

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∑ [(Course *credits*)] (for all Courses registered until that semester)

CGPA is thus computed from the I Year First Semester onwards, at the end of each Semester, as per the above formula. However, the SGPA of I year I Semester itself may be taken as the CGPA, as there are no cumulative effects.

15.4. **Illustrative Example:**

An illustrative example given in below Table below indicates the use of the above two equations in calculating SGPA and CGPA, both of which facilitate the declaration of academic performance of a student, at the end of a semester and at the end of successive semesters respectively. Both of them shall be normally calculated up to the second decimal position, so that the *CGPA,* in particular, can be made use of in rank ordering the student's performance in a class. If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *SGPA;* But, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A, B etc shall be taken into account in rank ordering of the students in a class.

| Year and Semester | Course No. | Credits | Grade | Grade Points | Credit Points |
|---|---|---|---|---|---|
| I Year I sem | XX101 | 5 | A | 8 | 40 |
| I Year I sem | XX102 | 4 | F | 0 | 00 |
| I Year I sem | XX103 | 3 | A+ | 9 | 27 |
| I Year I sem | XX104 | 4 | F | 0 | 00 |
| I Year I sem | XX105 | 5 | C | 5 | 25 |
| I Year I sem | XX106 | 5 | P | 4 | 20 |
| Total | | 26(18*) | | | 112 |
| **SGPA = 112/26 = 4.31** | | | **CGPA = 4.31** | | |
| I Year II Sem | XX107 | 5 | B+ | 7 | 35 |
| I Year II Sem | XX108 | 4 | A | 8 | 32 |
| I Year II Sem | XX109 | 3 | C | 5 | 15 |
| I Year II Sem | XX110 | 5 | P | 4 | 20 |
| I Year II Sem | XX111 | 4 | A+ | 9 | 36 |
| I Year II Sem | XX112 | 2 | F | 0 | 00 |
| I Year II Sem | Xx113 | 2 | A | 8 | 16 |
| **Total** | | 25(23*) | | | 154 |
| **SGPA = 154/25 = 6.16 CGPA = 266/51 = 5.22** | | | | | |

*Total No. of credits excluding those with 'F'; this is particularly important to keep track of the number of credits earned by a student up to any semester.

**16. Award of Division**

16.1. After a student has satisfied the requirements prescribed for the completion of the program and is Eligible for the award of B. Tech. Degree, he shall be placed in one of the following four divisions:

| CGPA | Class Awarded | |
|---|---|---|
| ≥8.00 | First Class with | From the CGPA secured from 160 credits |
| ≥6.50 - <8.00 | First Class | |
| ≥5.50 - <6.50 | Second Class | |
| ≥5.00 - <5.50 | Pass Class | |

16.2. The marks obtained in Internal Evaluation (IE) and Semester End Examination (SEE) will be shown in the memorandum of marks.

16.3. For the purpose of awarding first Class with Distinction (CGPA ≥ 8.0), the student must obtain the minimum required CGPA within 4 academic years or within 3 academic years in case of Lateral Entry candidates by clearing all the courses.

16.4. Candidates with disciplinary action pending/ prevented from writing the end semester examinations due to reason in any semester are not eligible for the award of First Class with Distinction. Such candidate's even if the CGPA ≥ 8.0 shall be placed in first class.

16.5. For the purpose of awarding First, Second and Pass Class, CGPA obtained in the examinations appeared within the maximum period allowed for the completion of course shall be considered as per the regulations.

16.6. A student with final CGPA (at the end of the UGP) < 5.00 will not be eligible for the award of the Degree.

16.7. The CGPA can be converted to equivalent percentage of marks by using the equation., % of Marks = (CGPA - 0.5) X 10.

**17. Consolidated Grade Card**

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the four years B. Tech Programme.

**18. Withholding of Results**

If a student is having any discipline related issues pending, the result of the student will be withheld and will not be allowed to move into the next semester. His/ her degree will be withheld in such cases and the matter will be referred to the academic council for final decision.

**19. Transitory Regulations**

19.1. Discontinued, detained for attendance, detained for want of credits, or failed students are eligible for readmission as and when the course is offered during the subsequent academic year as per the college admission procedures.

19.2. Students on transfer from a non- autonomous or from an autonomous college shall complete all the courses of the concerned programme not covered in the earlier organization. However, he/she should take the remaining courses in the programme along with the other students.

19.3. There shall be no branch transfers after the cut-off date of admissions made in the B.Tech. I year.

**20. Transcripts**

After successful completion of the total program of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee.

**21. Supplementary Examinations**

In addition to the Regular end semester examinations, Supplementary Examinations for the previous semesters will be conducted along with end sem. Examinations. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However, the maximum stipulated period cannot be relaxed under any circumstances.

**22. Graduation Ceremony**

22.1. The College shall have its own annual Graduation Ceremony for the award of degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

22.2. The College shall institute Prizes and Awards to meritorious students, for being given away annually at the Graduation Ceremony.

**23. Termination from the Program**

The admission of a student to the program may be terminated and the student may be asked to leave the Institute in the following circumstances:

23.1. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

23.2. The student fails to satisfy the norms of discipline specified by the institute from time to time.

**24. Non-Credit Courses (Mandatory Courses)**

24.1. Requirement of 75% attendance as per the college regulations is compulsory of completing the mandatory courses.

24.2. Specified number of Mandatory Courses among the designated ones is compulsory requirement for all the students for the award of B.Tech. Degree.

24.3. Although these courses do not carry any credits, performance in these subjects is evaluated following the procedure adopted for other subjects with the same marks. However, their performance will be indicated in the student's memo of marks as Satisfactory/ Unsatisfactory.

24.4. Although mandatory courses are Non-Credit Course, all the students should secure a minimum of 40% marks in the end sem. exam conducted by the college along with the other examinations for the award of B.Tech., degree.

**25. Amendments**

The Academic regulations here under are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

**26. General**

26.1. Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

26.2. The academic regulation should be read as a whole for the purpose of an interpretation.

26.3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

26.4. The college may change the academic regulations, course structure & syllabi at any time.

# ACADEMIC REGULATIONS FOR B. TECH. (LATERAL ENTRY STUDENTS)

Applicable for the students admitted into II Year B. Tech. (Lateral Entry Scheme) from the Academic Year 2019-20 and onwards.

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

1.1 The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

1.2 The candidate shall register for 122 credits and secure 122 credits by securing a minimum CGPA of 5.0 from the exams. of B.Tech. II to IV year for the award of B.Tech. Degree.

1.3 The students, who fail to fulfil the requirement for the award of the degree in six Academic years from the year of admission, shall forfeit their seats. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

**2. Promotion Rule**

2.1. A student shall be promoted from B.Tech., II Year to III Year if he/ she gets at least a minimum of 20 out of 40 credits, up to II year II semester, from all the examinations, whether or not the candidate takes the examinations.

2.2. A student shall be promoted from III year to IV year if he/ she gets a minimum of 41 out of 82 credits, up to III year II semester, from all the examinations, whether or not the candidate takes the examinations.

2.3. A student shall register and put up minimum attendance in all 122 credits and earn all 122 credits to be eligible for the award of B.Tech degree.

2.4. A student, who fails to earn 122 credits as indicated in the course structure within six academic years, shall forfeit his/ her admission in B.Tech. Course.

**3. Award of Class**

A student, who satisfies all the requirements prescribed for the completion of the B.Tech. program, is eligible for the award of the said degree, in any one of the following four classes:

| CGPA | Class Awarded | |
|---|---|---|
| ≥8.00 | First Class with | From the CGPA secured from 122 credits |
| ≥6.50 - <8.00 | First Class | |
| ≥5.50 - <6.50 | Second Class | |
| ≥5.00 - <5.50 | Pass Class | |

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

**5.** The malpractice rules and procedures for evaluating the SGPA and CGPA mentioned under points 9 - 27, are also applicable to the later entry students.

## COURSE STRUCTURE FOR B.TECH I YEAR

**I B. Tech I Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | BS-1 | Mathematics-I | 3 | 1 | 0 | 4.0 |
| 2. | BS-2 | Applied Physics | 3 | 1 | 0 | 4.0 |
| 3. | BS-Lab 1 | Applied Physics Lab | 0 | 0 | 3 | 1.5 |
| 4. | ES -1 | Basic Electrical Engineering | 3 | 0 | 0 | 3.0 |
| 5. | ES-Lab 1 | Basic Electrical Engineering Lab | 0 | 0 | 2 | 1.0 |
| 6. | ES-2 | Engineering Graphics & Modeling | 1 | 0 | 3 | 2.5 |
| 7. | H&S-Lab 1 | English Language Skills Lab (ELSL) | 0 | 0 | 2 | 1.0 |
| 8. | ES-3 | Programming for Problem Solving-I | 2 | 0 | 0 | 2.0 |
| 9. | ES-Lab 2 | Programming for Problem Solving Lab-I | 0 | 0 | 2 | 1.0 |
| **Total number of Credits** | | | **12** | **2** | **12** | **20** |

**I B.Tech II Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | BS-3 | Mathematics-II | 3 | 1 | 0 | 4.0 |
| 2. | BS-4 | Chemistry | 3 | 1 | 0 | 4.0 |
| 3. | BS-Lab 2 | Chemistry Lab | 0 | 0 | 3 | 1.5 |
| 4. | H&S-1 | English | 2 | 0 | 0 | 2.0 |
| 5. | H&S-Lab 2 | English Communication Skills Lab (ECSL) | 0 | 0 | 2 | 1.0 |
| 6. | ES-4 | Programming for Problem Solving-II | 2 | 0 | 0 | 2.0 |
| 7. | ES-Lab3 | Programming for Problem Solving Lab-II | 0 | 0 | 2 | 1.0 |
| 8. | ES-Lab 4 | Engineering Workshop | 0 | 1 | 3 | 2.5 |
| **Total number of Credits** | | | **10** | **3** | **10** | **18** |

## COURSE STRUCTURE FOR B.TECH II YEAR

**II B.Tech I Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | BS-5 | Complex Analysis and Fourier Transforms | 3 | 0 | 0 | 3.0 |
| 2. | ES-1 | OOP Through JAVA | 3 | 0 | 0 | 3.0 |
| 3. | PC-1 | Electronic Devices and Circuits | 3 | 0 | 0 | 3.0 |
| 4. | BS-6 | Probability Theory and Stochastic Processes | 3 | 0 | 0 | 3.0 |
| 5. | PC-2 | Signals and Systems | 3 | 0 | 0 | 3.0 |
| 6. | PC – 3 | Network Analysis and Transmission Lines | 3 | 0 | 0 | 3.0 |
| 7. | PC Lab-1 | Electronic Devices and Circuits Laboratory | 0 | 0 | 2 | 1.0 |
| 8. | PC Lab-2 | Basic Simulation Laboratory | 0 | 0 | 2 | 1.0 |
| 9. | MC-1 | Gender Sensitization | 2 | 0 | 0 | 0 |
| **Total number** | | | **20** | **0** | **4** | **20** |

**II B.Tech II Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | PC-4 | Switching Theory and Logic Design | 2 | 1 | 0 | 3.0 |
| 2. | ES-2 | Electrical Technology | 3 | 0 | 0 | 3.0 |
| 3. | H&S-2 | Professional Communications | 2 | 0 | 0 | 2.0 |
| 4. | PC-5 | Analog and Digital Communications | 3 | 1 | 0 | 4.0 |
| 5. | PC-6 | Analog and Pulse Circuits | 3 | 0 | 0 | 3.0 |
| 6. | PC-7 | Electromagnetic Waves | 3 | 0 | 0 | 3.0 |
| 7. | PC Lab-3 | Analog & Digital Comm. Laboratory | 0 | 0 | 2 | 1.0 |
| 8. | PC Lab-4 | Analog and Pulse Circuits Laboratory | 0 | 0 | 2 | 1.0 |
| 9. | MC-2 | Environmental Science | 2 | 0 | 0 | 0 |
| **Total number** | | | **18** | **2** | **4** | **20** |

## COURSE STRUCTURE FOR B.TECH III YEAR

**III B.Tech I Semester:**

| S.No | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | ES – 3 | Control Systems | 3 | 0 | 0 | 3.0 |
| 2 | PC – 8 | Microprocessors & Microcontrollers | 2 | 1 | 0 | 3.0 |
| 3 | PC – 9 | Linear & Digital IC Applications | 3 | 0 | 0 | 3.0 |
| 4 | PC – 10 | Antenna And Propagation | 3 | 0 | 0 | 3.0 |
| 5 | PE-1 | **Professional Elective-1**<br>1. Computer Architecture<br>2. Information Theory and Coding<br>3. Introduction to Mems | 3 | 0 | 0 | 3.0 |
| 6 | OE-1 | **Open Elective-1**<br>1. Introduction to Microcontrollers<br>2. Basic Electronics | 3 | 0 | 0 | 3.0 |
| 7 | PC Lab-5 | Microprocessor and Microcontrollers Laboratory | 0 | 0 | 2 | 1.0 |
| 8 | PC Lab-6 | Linear & Digital IC App. Laboratory | 0 | 0 | 2 | 1.0 |
| 9 | MC – 3 | Personality Development & Behavioural Skills | 2 | 0 | 0 | 1.0 |
| **Total Number** | | | **19** | **1** | **4** | **21** |

**III B.Tech II Semester:**

| S.No | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | H&S-3 | Managerial Economics & Financial Analysis | 3 | 0 | 0 | 3.0 |
| 2 | PC-11 | Digital Signal Processing | 2 | 1 | 0 | 3.0 |
| 3 | PC-12 | Microwave Engineering | 2 | 1 | 0 | 3.0 |
| 4 | PC-13 | Data Communication and Networking | 2 | 1 | 0 | 3.0 |
| 5 | PE-2 | **Professional Elective-2**<br>1. Digital Signal Processors and Architectures<br>2. Modelling and Simulation using MATLAB<br>3. Optical Communications | 3 | 0 | 0 | 3.0 |
| 6 | OE – 2 | **Open Elective-2**<br>1. Basic Electronic Instrumentation<br>2. Consumer Electronics | 3 | 0 | 0 | 3.0 |
| 7 | PC Lab-7 | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1.0 |
| 8 | H&S-Lab 3 | Adv. Communication Skills Laboratory | 0 | 0 | 2 | 1.0 |
| 9 | MC – 4 | Quantitative Methods & Logical Reasoning | 2 | 0 | 0 | 1.0 |
| **Total Number** | | | **17** | **3** | **4** | **21** |

## COURSE STRUCTURE FOR B.TECH III YEAR (FAST TRACK)

**III B.Tech II Semester:**

| S.No | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | H&S-3 | Managerial Economics & Financial Analysis | 3 | 0 | 0 | 3.0 |
| 2 | PC-11 | Digital Signal Processing | 2 | 1 | 0 | 3.0 |
| 3 | PC-12 | Microwave Engineering | 2 | 1 | 0 | 3.0 |
| 4 | PC-13 | Data Communication and Networking | 2 | 1 | 0 | 3.0 |
| 5 | PE-2 | **Professional Elective-2**<br>1. Digital Signal Processors and Architectures<br>2. Modeling and Simulation using MATLAB<br>3. Optical Communications | 3 | 0 | 0 | 3.0 |
| | **PC-16** | **Fast Track** | | 0 | 0 | |
| 6 | OE – 2 | **Open Elective-2**<br>1. Basic Electronic Instrumentation<br>2. Consumer Electronics | 3 | 0 | 0 | 3.0 |
| 7 | PC Lab-7 | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1.0 |
| 8 | H&S-Lab 3 | Adv. Communication Skills Laboratory | 0 | 0 | 2 | 1.0 |
| 9 | MC – 4 | Quantitative Methods & Logical Reasoning | 2 | 0 | 0 | 1.0 |
| **Total Number** | | | **17** | **3** | **4** | **21** |

## COURSE STRUCTURE FOR B.TECH IV YEAR

**IV B.Tech I Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PC – 14 | Embedded System Design | 2 | 1 | 0 | 3.0 |
| 2 | PC – 15 | VLSI Design | 2 | 1 | 0 | 3.0 |
| 3 | PE-3 | **Professional Elective-3**<br>1. Digital Image Processing<br>2. Cellular and Mobile Communications<br>3. Radar Engineering | 3 | 0 | 0 | 3.0 |
| 4 | PE-4 | **Professional Elective-4**<br>1. Biomedical Instrumentation<br>2. Satellite Communications<br>3. Telecommunication Switching Systems and Networks | 3 | 0 | 0 | 3.0 |
| 5 | OE-3 | **Open Elective-3**<br>1. Automotive Electronics<br>2. Introduction to Communication Engineering | 3 | 0 | 0 | 3.0 |
| 6 | PC Lab-8 | Embedded & VLSI Laboratory | 0 | 0 | 2 | 1.0 |
| 7 | PC Lab-9 | Antenna and Microwave Engineering Laboratory | 0 | 0 | 2 | 1.0 |
| 8 | Mini Project | Mini Project | 0 | 0 | 0 | 3.0 |
| **Total Number** | | | **13** | **2** | **4** | **20** |

**IV B.Tech II Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PC-16 | Electronic Measurements & Instrumentation | 3 | 0 | 0 | 3.0 |
| 2 | PC-17 | Wireless Communications and Networks | 3 | 0 | 0 | 3.0 |
| 3 | TS | Technical Seminar | 0 | 0 | 0 | 2.0 |
| 4 | CVV | Comprehensive Viva Voce | 0 | 0 | 0 | 2.0 |
| 5 | MP | Major Project | 0 | 0 | 0 | 10.0 |
| **Total number** | | | **6** | 0 | 0 | **20** |

## COURSE STRUCTURE FOR B.TECH IV YEAR (FAST TRACK)

**IV B.Tech I Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PC – 14 | Embedded System Design | 2 | 1 | 0 | 3.0 |
| 2 | PC – 15 | VLSI Design | 2 | 1 | 0 | 3.0 |
| 3 | PE-3 | **Professional Elective-3**<br>1. Digital Image Processing<br>2. Cellular and Mobile Communications<br>3. Radar Engineering | 3 | 0 | 0 | 3.0 |
| 4 | PE-4 | **Professional Elective-4**<br>1. Biomedical Instrumentation<br>2. Satellite Communications<br>3. Telecommunication Switching Systems and Networks | 3 | 0 | 0 | 3.0 |
| | **PC-17** | **Fast Track** | | 0 | 0 | |
| 5 | OE-3 | **Open Elective-3**<br>1. Automotive Electronics<br>2. Introduction to Communication Engineering | 3 | 0 | 0 | 3.0 |
| 6 | PC Lab-8 | Embedded & VLSI Laboratory | 0 | 0 | 2 | 1.0 |
| 7 | PC Lab-9 | Antenna and Microwave Engineering Laboratory | 0 | 0 | 2 | 1.0 |
| 8 | - | Mini Project | 0 | 0 | 0 | 3.0 |
| **Total Number** | | | **13** | **2** | **4** | **20** |

**MATHEMATICS - I**
**(Matrices and Calculus)**

**I Year I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Outcomes:**

1. Write the matrix representation of system of linear equations and identify the consistency of the system of equations.
2. Find the Eigen values and Eigen vectors of the matrix and discuss the nature of the quadratic form.
3. Analyze the convergence of sequence and series.
4. Discuss the applications of mean value theorems to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions.
5. Examine the extrema of functions of two variables with/ without constraints.

**UNIT-I:**
**Matrices and Linear System of Equations:**
Matrices and Linear system of equations: Real matrices – Symmetric, skew - symmetric, Orthogonal. Complex matrices: Hermitian, Skew – Hermitian and Unitary. Rank-Echelon form, Normal form. Solution of Linear Systems – Gauss Elimination, Gauss Jordan & LU Decomposition methods.

**UNIT-II:**
**Eigen Values and Eigen Vectors:**
Eigen values, Eigen vectors – properties, Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonalization of matrix- Quadratic forms: Reduction to Canonical form, Nature, Index, Signature.

**UNIT-III:**
**Sequences & Series:**
Basic definitions of Sequences and series, Convergence and divergence, Ratio test, Comparison test, Cauchy's root test, Raabe's test, Integral test, Absolute and conditional convergence.

**UNIT-IV:**
**Beta & Gamma Functions and Mean Value Theorems:**
Gamma and Beta Functions-Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.
Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Generalized Mean Value theorem (all theorems without proof) – Geometrical interpretation of Mean value theorems.

**UNIT-V:**
**Functions of Several variables:**
Partial Differentiation and total differentiation, Functional dependence, Jacobian Determinant-Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

**Textbooks:**

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010.
2. Advanced Engineering Mathematics, Jain &Iyengar, Narosa Publications.

**Reference Books:**


1. Calculus and Analytic Geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition), Michael D. Greenberg.

# APPLIED PHYSICS

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**I Year I Semester**

**Course Outcomes:**

1. Identify various optical phenomena of light.
2. Discuss the basic principles of quantum mechanics.
3. Classify solids based on the band theory.
4. Elucidate the characteristics of semiconductors and semiconductor devices.
5. Explain the working principle of lasers and optical fibers.

**UNIT – I:**

**Wave Optics:**

Principle of Superposition, coherence and methods to produce coherent sources, Interference - Interference in thin films by reflection, Newton's Rings. Diffraction – Fraunhofer and Fresnel Diffraction, Farunhofer diffraction due to single slit, Plane Diffraction Grating, resolving power of Grating. Polarization – Polarization of light waves, Plane of vibration, plane of polarization, Double refraction, Nicol's Prism, Applications of Polarization.

**UNIT-II:**

**Introduction to Quantum Mechanics and Free Electron Theory:**

Classical free electron Theory, Electrical Conductivity and Ohm's Law – Drawbacks, Sommerfeld theory (Qualitative).Introduction to quantum physics: Black body radiation and Planck's Law(Qualitative), wave-particle duality, de-Broglie hypothesis of matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, time independent Schrodinger equation, Born interpretation of wave function, particle in an infinite potential well (one dimension).

**UNIT-III:**

**Band theory of Solids and Semiconductors:**

Kronig-Penny model(Qualitative), E-k diagram, Energy bands in solids, classification of materials into metals, semiconductors, and insulators, Effective mass, Density of States, Fermi distribution function, Fermi level and its importance. Intrinsic semiconductors, carrier concentration in intrinsic semiconductors, energy band diagram and position of Fermi level in intrinsic semiconductors, equation for electrical conductivity of semiconductors, extrinsic semiconductors.

**UNIT-IV:**

**Semiconductor Devices:**

Direct and indirect band-gap semiconductors, Formation of p-n junction, energy diagram of PN junction, I-V characteristics of PN junction diode, Photo diode, solar cell-efficiency, light emitting diode and their characteristics, semiconductor laser: device structure and characteristics, Hall effect and its applications.

**UNIT-V:**

**Fiber Optics and Lasers:**

Introduction, total internal reflection, acceptance angle and numerical aperture, losses associated with optical fibers, step and graded index fibers, applications of optical fibers. Introduction to interaction of radiation with matter: stimulated absorption, spontaneous emission and stimulated emission, Einstein's coefficients and their relations, characteristics of a laser, important components of a laser: active medium, pumping source, optical resonator. Population inversion, Ruby laser, He-Ne laser, applications of lasers.

**Textbooks:**


1. Engineering Physics, P K Palanisamy, Scietech publication.
2. Engineering Physics, V Rajendran, McGraw Hill Education.


**Reference Books:**


1. Engineering Physics, S O Pillai, Sivakami, New Age International (P) Limited.
2. Physics Volume I & II, Resnick and Halliday, John Wiley and sons, Inc.

## APPLIED PHYSICS LAB

**I Year I Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

1. Apply optical phenomena to characterize optical sources and components.
2. Determine the energy gap of a semiconductor diode and time constant of RC circuit
3. Describe the electrical characteristics of PN junction diode, photodiode, LED and solar cell.
4. Demonstrate the resonance in mechanical and electrical waves.
5. Identify the magnetic Induction along the axis of current carrying coil.

### List of Experiments

1. Newton's rings: Determination of the radius of curvature of the lens by forming Newton's rings.
2. Diffraction grating: To determine the number of lines per inch of the grating.
3. Dispersive power: To determine the dispersive power of prism by using spectrometer.
4. Single Slit Diffraction using Lasers- Determination of wavelength of a Monochromatic Source (LASER).
5. Energy gap of P-N junction diode: Determination of the energy gap of a semiconductor diode.
6. Photo diode: Study the V-I Characteristics of Photo diode.
7. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
8. Solar cell: Study the V-I Characteristics of Solar cell.
9. Stewart & Gee's experiment - Determination of magnetic Induction along the axis of current carrying coil.
10. LCR Circuit- Determination of the Resonance frequency of forced electrical oscillator.
11. RC- Circuit – Determination of the time constant of RC-circuit.
12. Optical fiber: Determination of the Numerical aperture of Optical fiber.

Note: Any 10 experiments are to be performed.

# BASIC ELECTRICAL ENGINEERING

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**I Year I Semester**

**Course Outcomes:**

1. Understand the fundamentals of basic circuit components and their characteristics.
2. Analyze basic electrical circuits with A.C excitation.
3. Understand the concepts of magnetic circuits and transformers.
4. Acquire the basic concepts of electrical motors.
5. Understand the concept of A.C generator and low voltage electrical installations.

**UNIT I:**

**Introduction to Electrical Engineering and DC Circuits:**

Basic definitions, types of elements, types of sources, Kirchhoff's Laws, resistive networks, inductive networks, series, parallel circuits, Star- Delta and Delta- Star transformation, Network theorems- Superposition, Thevenin's - simple problems.

**UNIT II:**

**AC Circuits:**

Representation of sinusoidal waveforms, peak, RMS and average values **-** Elementary treatment of single-phase AC circuits consisting of R, R-L, R-C, R-L-C combinations (series and parallel) **-** Phase representation, real power, reactive power, apparent power, resonance concept. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III:**

**Magnetic Circuits &Transformers:**

**Magnetic Circuits:** Magnetic materials, Faraday's laws of Electromagnetic Induction, BH characteristics, Magnetic Circuits - concept of Self & Mutual Inductance.

**Transformers:** Ideal and practical single phase transformer, OC-SC tests, equivalent circuit, losses in transformer, regulation and efficiency - simple problems.

**UNTI IV:**

**DC Machines and Induction Motors:**

**DC Machines:** Construction, Principle and Operation of DC Motor, Voltage- torque equations - simple problems.

**Three Phase Induction Motor:** Construction, Principle and working of three phase Induction Motor, torque slip characteristics, - simple problems.

**Single Phase Induction Motor:** Single phase Induction Motor construction and working principle, capacitor start - applications

**UNIT V:**

**AC Generator & Electrical Installation:**

**AC Generator:** Construction, Principle of operation of Synchronous Generator, Pitch Factor- Distribution Factor (or winding factor) - EMF equation – simple problems.

**Electrical Installation:** Fuse, Circuit breakers, difference between fuse and circuit breaker, Types of Batteries, battery backup.

**Textbooks:**


1. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited, 2nd Edition.
2. Basic Electrical Engineering, T.K. Nagsarkar and M.S. Sukhija, Oxford University Press, 3rd Edition.


**Reference Books:**


1. Circuits and Networks, A.Sudhakar & Shyam Mohan.S, Tata McGraw Hill Publishing Company limited, 5th Edition.
2. Basic Electrical Engineering, K.Uma Rao and A.Jayalakshmi, Pearson Publications.
3. Basic Electrical Engineering by D C Kulshreshtha, McGraw Hill Education Private limited, 1st Edition.

## BASIC ELECTRICAL ENGINEERING LAB

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**I Year I Semester**

**Course Outcomes:**

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters.
4. Understand the performance characteristics of D.C electrical machines.
5. Understand the performance characteristics of A.C electrical machines.

**List of experiments/ demonstrations:**

**Any 5 experiments from Part-A and Part-B should be conducted (Total 10 Experiments)**

**Part A**

1. Verification of Ohms law.
2. Verification of KVL and KCL.
3. Verification of Thevenin's Theorem
4. Verification of Superposition Theorem.
5. Transient Response of Series R- L and R - C circuits using DC excitation.
6. Determination and Verification of Impedance and Current of RL and RC series circuits.

**Part B**

1. Transient Response of R-L-C Series circuit using DC excitation.
2. Load Test on Single Phase Transformer. (Calculate Efficiency and Regulation)
3. OC & SC Test on Single phase transformer
4. Brake test on DC shunt motor
5. Brake test on Three Phase Squirrel cage induction motor.
6. OCC of Three phase alternator.

**Reference Books:**


1. Circuits and Networks, A.Sudhakar & Shyam Mohan.S, Tata McGraw Hill Publishing Company Limited, 5th Edition.
2. Basic Electrical Engineering, T.K. Nagsarkar and M.S. Sukhija, Oxford University Press, 3rd Edition
3. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited, 2nd Edition

## ENGINEERING GRAPHICS & MODELING

| L | T | P | C |
|---|---|---|---|
| 1 | 0 | 3 | 2.5 |

**I Year I semester**

**Course Outcomes:**

1. Understand the concepts of engineering drawing of planes, solids and the CAD drawing software.
2. Applying the principles of engineering graphics while drawing the engineering components.
3. Analyze the sectional views for their configurations.
4. Evaluate the surfaces of solids developed for further processing in the engineering applications.

**UNIT– I:**

**Introduction to Engineering Drawing:** Principles of engineering graphics and their significance, usage of drawing instruments, conic sections, including the rectangular hyperbola- General method only. Cycloid, Epicycloid, Hypocycloid. Scales – Plain & Diagonal only.

**Introduction to CAD:** Introduction to CAD software and its importance, standard toolbar/menus and navigation tools used in the software, using basic commands limits ,units, grid, test , move, offset ,mirror, rotate, trim, extend, fillet etc. drawing lines using line command. Drawing spline, ellipse, circle, rectangle etc.. Concept of layers and dimensioning.

**UNIT-II:**

**Principles of Orthographic Projections**: Conventions, projections of points, projections of lines (first angle projection) inclined to both planes (traces and midpoint problem to be excluded).

**Implementation of CAD:** Drawing orthographic projections of points and lines using a CAD package.

**UNIT – III:**

**Projections of the Planes:** Projections of regular planes inclined to both the planes.

**Projections of Solids:** Projections of regular solids inclined to both the planes (prisms, pyramids, cones and cylinders, change of potion method only).

**Implementation in CAD:** Drawing orthographic projection of planes and regular solids using a CAD package.

**UNIT – IV:**

**Sections and Sectional Views of Right Angular Solids**: Prism, Cylinder, Pyramid, Cone. Development of surfaces of right regular solids - Prism, Pyramid, Cylinder and Cone.

**Implementation in CAD**: Concept of hatching, drawing sectional views of solids and the development of right regular solids using a CAD package.

**UNIT-V:**

**Principles of Isometric projection:** Isometric scale, isometric views, conventions, isometric views of lines, planes, simple solids, conversion of isometric views to orthographic views and vice-versa, conventions.

**Implementation in CAD:** Drawing isometric views of simple solids. Drawing isometric views from giving orthographic views and vice-versa using a CAD package.

**Note: Implementation in CAD (For Internal Evaluation Weightage Only)**

**Textbooks:**

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Charotar Publishing House.

**Reference Books:**


1. Engineering Graphics, Agrawal B. & Agrawal C. M. (2012), TMH Publication, Text book on Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers.
2. Engineering Drawing and Computer Graphics, Shah, M.B. & Rana B.C. (2008), Pearson Education.
3. http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac_2013_users_guide.pdf

## ENGLISH LANGUAGE SKILLS LAB

**I Year I Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes:**

1. Reproduce speech sounds and improve fluency in language.
2. Understand syllables and consonant clusters for appropriate pronunciation.
3. Exhibit effective professional skills with rhetoric eloquence.
4. Deliver enthusiastic and well-practiced presentation.
5. Learn Task-Based Language Learning (TBLL) through various language learning activities effectively.

**Exercise- I:**
**CALL Lab:**
Introduction to Pronunciation- Speech Sounds, Vowels and Consonants- Practice for Listening.
**ICS Lab**:
Ice-Breaking activity and JAM session.

**Exercise-II:**
**CALL Lab:**
Silent Letters, Consonant Clusters, Homographs.
**ICS Lab:**
Common Everyday Situations: Conversations and Dialogues.

**Exercise-III:**
**CALL Lab:**
Syllables.
**ICS Lab:**
Communication at Workplace, Social and Professional Etiquette.

**Exercise-IV:**
**CALL Lab**:
Word Accent and Stress Shifts.
**ICS Lab:**
Formal Presentations, Visual Aids in Presentations.

**Exercise-V:**
**CALL Lab:**
Intonation, Situational dialogues for practice.
**ICS Lab:**
Interviews, Types of Interviews.

**Reference Books:**


1. A Textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan Publishers, 2010.
2. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.

## PROGRAMMING FOR PROBLEM SOLVING-I

**I Year I Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

**Course Outcomes:**

1. Design Algorithms and Flowcharts for real world applications using 'C'.
2. Know the usage of various operators in Program development.
3. Design programs involving decision and iteration structures.
4. Apply the concepts code reusability using Functions.
5. Analyze various searching and sorting techniques using Arrays.

**UNIT-I:**

**Problem Solving Using Computers:** Introduction, Algorithms, Flowcharts and Pseudo code, Applications of C language.

**Overview of C Language:** Introduction, Salient Features of C Language, Structure of a "C" Program.

**C Language Preliminaries:** Keywords and Identifiers, Constants, Variables, Data Types, and Input / Output Statements with suitable illustrative "C" Programs.

**UNIT-II:**

**Operators**: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative "C" Programs.

**UNIT-III:**

**Statements in C:**

**Conditional/Decision Statements**: if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative "C" Programs.

**Loop Control Statements**: while, do-while and for with suitable illustrative "C" Programs.

**UNIT-IV:**

**Functions**: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs exit( ), Parameter Passing mechanism: Call-by-Value, Recursion, Storage Classes.

**UNIT-V:**

**Arrays:** Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions.

**Searching and Sorting:** Linear Search, Binary Search, Bubble Sort, Insertion Sort.

**Textbooks:**


1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A. Forouzon and R.F. Gilberg, Third edition, CENGAGE Learning, 2016.
2. C and Data Structures, Ashok N. Kamthane, Pearson Education. 2010.


**Reference Books:**


1. Problem Solving Using C, M.T. Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition,University Press.
3. Programming in C 2/e, Pradip Dey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers, Rajaraman V., 4th Edition, Prentice Hall of India,2006.
5. Programming in C, R S Bichker, University Press, 2012.

## PROGRAMMING FOR PROBLEM SOLVING LAB – I

**I Year I Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes:**

1. Apply the specification of syntax rules for numerical constants and variables, data types.
2. Know the Usage of various operators and other C constructs.
3. Design programs on decision and control constructs.
4. Develop programs on code reusability using functions.
5. Implement various searching and sorting techniques using arrays.

**Week 1**
Ubuntu and Linux Commands.

**Week 2**
Designing of flowcharts and algorithms using raptor tool.
1. Areas of Polygons.
2. Calculation of Simple and Compound Interest.
3. Swapping of Two numbers with and without temporary variable.
4. Checking whether a number is even or odd.
5. Sum of first 'n' natural numbers.
6. Checking a number whether it is divisible by any given number.
7. Evaluation of mathematical expressions.
8. Programs using scanf( ) and printf( ) statements.

**Week 3**
Programs on operators. (Minimum 4 Programs)

**Week 4, 5 & 6**
Programs on Conditional Statements. (Minimum 12 Programs)

**Week 7,8 & 9**
Programs on Control Statements. (Minimum 12 Programs)

**Week 10 &11**
Programs on Functions. (Minimum 6 Programs)

**Week 12**
Programs on One Dimensional Arrays. (Minimum 3 Programs)

**Week 13**
Programs on Two Dimensional Arrays. (Minimum 2 Programs)

**Week 14**
Implementation of Linear Search and Binary Search.

**Week 15**
Implementation of Bubble Sort and Insertion Sort.

**Week 16**
Review

**MATHEMATICS - II**
**(Ordinary Differential Equations and Vector Calculus)**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**I Year II Semester**

**Course Outcomes:**

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real-world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real-world problems.
3. Find the Laplace Transform of various functions and apply to find the solutions of differential equations.
4. Evaluate the multiple integrals and identify the vector differential operators physically in engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

**UNIT-I:**
**First order Ordinary Differential Equations and their Applications:**
Formation of Differential equations, Differential equations of first order and first degree: exact, linear and Bernoulli, Applications of ODE: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

**UNIT-II:**
**Higher Order Linear Differential Equations:**
Linear differential equations of second and higher order with constant coefficients, RHS term of the type f(X) $= e^{ax}, \sin ax, \cos ax \text{ and } x^k, e^{ax}V(x), x^kV(x)$. Method of variation of parameters

**UNIT-III:**
**Laplace transforms:**
Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms – Application of Laplace transforms to ordinary differential equations.

**UNIT-IV:**
**Multiple Integrals & Vector Differentiation:**
Multiple integrals - double and triple integrals – change of order of integration (Only Cartesian form)- change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral). Gradient- Divergence- Curl and their related properties - Potential function - Laplacian and second order operators.

**UNIT-V:**
**Vector Integration:**
Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green's, Stoke's and Gauss Divergence Theorems (Only Statements & their Verifications).

**Textbooks:**


1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010.
2. Advanced Engineering Mathematics, Jain & Iyengar Narosa Publications.


**Reference Books:**


1. Calculus and Analytic Geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition), Michael D. Greenberg.

## CHEMISTRY

**I Year II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Outcomes:**

1. Acquire knowledge of atomic, molecular and electronic changes related to conductivity.
2. Apply the various processes of treatment of water for both domestic and industrial purpose.
3. Apply the knowledge of electrode potentials for the protection of metals from corrosion.
4. Analyze the major chemical reactions that are used in the synthesis of compounds.
5. Apply the knowledge of polymers in every day's life.

**UNIT- I:**

**Atomic and Molecular Structure:**

Introduction, Concept of atomic and molecular orbitals, LCAO, Molecular orbitals of di-atomic molecules, Molecular orbital energy level diagrams of diatomic molecules ($N_2$, O2 & $F_2$). Pi-molecular orbitals of butadiene and benzene.

Crystal field theory (CFT): Crystal field theory, Crystal field splitting patterns of transition metal ion d- orbital- tetrahedral, octahedral and square planar geometries.

**UNIT- II:**

**Water Technology:**

Hardness of water, expression of hardness ($CaCO_3$ equivalent), units and types of hardness. Estimation of temporary and permanent hardness of water by EDTA method. Numerical problems based on hardness of water. Potable water: characteristics, treatment of water for domestic supply. Desalination of brackish water: reverse osmosis. Alkalinity of water and its determination. Boiler feed water and its treatment: Internal treatment (colloidal, phosphate calgon conditioning of water). External treatment (ion –exchange process).

**UNIT- III:**

**Electrochemistry and Corrosion:**

Electrode, electrode potential, galvanic cell, cell reactions and cell notation, cell EMF, types of electrodes (Calomel electrode and Quinhydrone electrode), Determination of $P^H$ using quinhydrone electrode. Nernst equation, Numerical problems. Batteries: Introduction to cell and battery, Primary (lithium cell) and secondary cells, (lead-Acid cell, and Lithium ion cells). Fuel cells Hydrogen Oxygen fuel cell, advantages and engineering applications of fuel cells.

Corrosion: Introduction, types of corrosion: chemical and electrochemical corrosion, factors affecting the rate of corrosion: nature of the metal, position of metal in galvanic series, purity of metal, nature of corrosion product, nature of environment: effect of temperature, effect of pH, humidity. Corrosion control methods: Cathodic protection: sacrificial anode method and impressed current cathode method. Protective coatings: metallic coatings (anodic and cathodic), methods of application on metals, electroplating (of copper), electroless plating (of Ni), organic coatings-paints.

**UNIT-IV:**

**Stereochemistry:**

Structural isomers and stereoisomers, configurations, symmetry and chirality, enantiomers, diastereomers, optical activity. Conformations of cyclic (cyclohexane) and acyclic systems (Ethane).

**Organic Seactions and Synthesis of a Drug Molecule:**

Introduction to reactions involving substitution (SN1 & SN2), addition (addition of HBr to propene, Markownikoff and Anti Markownikoff addition), elimination, oxidation (oxidation of alcoholsusing $KMnO_4$ & $CrO_3$), reduction (reduction of carbonyl compounds by $LiAlH_4$ & $NaBH_4$). Synthesis of a commonly used drug molecule- paracetamol and Asprin.

**UNIT-V:**

**Polymer Chemistry:**

Introduction, classification of polymers, types of polymerization (addition and condensation, mechanisms not included). Plastics- types of plastics -thermoplastics and thermosetting plastics. Preparation, properties and engineering applications of PVC, Teflon and Bakelite. Fibers: Nylon 6, 6 and Terelene (Dacron). Elastomers: natural rubber, structure, vulcanization. Synthetic rubbers: Buna-S, Butyl rubber & Thikol rubber. Conducting polymers: classification and applications.

Biodegradable polymers:Types, examples: Polyhydroxy butyrate (PHB) ,Poly-Hydroxybutyrate-co-b-Hydroxy valerate (PHBV) ,Polyglycolic acid (PGA), Polylactic acid (PLA), Poly (Î-caprolactone) (PCL). Applications of biodegradable polymers.

**Textbooks:**

1. Engineering Chemistry, P.C Jain & Monica Jain, Dhanpat Rai Publications, 2017.
2. Engineering Chemistry, Bharathi Kumari. Y, VGS Publications, 2018.

**Reference Books:**

1. March's Advanced Organic Chemistry, Smith, Wiley publications, 2017.
2. Engineering Chemistry, Shiva Sankar, TMH Publications, 2010.

## CHEMISTRY LAB

**I Year II Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

1. Determination of parameters like hardness, alkalinity and chloride content in water.
2. Estimation of rate constant of a reaction from concentration-time relationships.
3. Determination of physical properties like adsorption, surface tension and viscosity.
4. Synthesize a small drug molecule and analyze a salt sample.
5. Calculation of strength of compound using instrumentation techniques.

**Choice of 10-12 experiments from the following:**

1. Estimation of total hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of chloride content of water.
4. Estimation of HCl by conductometric titration.
5. Estimation of mixture of acids by conductometric titration.
6. Estimation of HCl by potentiometric titration.
7. Estimation of $Fe^{2+}$ by potentiometry using $KMnO_4$.
8. Determination of the rate constant of a reaction.
9. Determination of surface tension.
10. Determination of viscosity of a lubricant.
11. Chemical analysis of a salt.
12. Synthesis of a polymer/drug.
13. Adsorption of acetic acid by charcoal.
14. Determination of Saponification /acid value of an oil.

**Reference Books:**


1. Practical Engineering Chemistry, Mukkanti, B.S. Publications, 2010.
2. Volga's Qualitative Inorganic Chemistry, PEAR Publications 2010.

## ENGLISH

**I Year II Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

**Course Outcomes:**

1. Infer the importance of scientific discoveries in promoting social responsibilities.
2. Comprehend the given texts and respond appropriately for technical and professional purposes.
3. Communicate confidently and transfer information into various forms of writing.
4. Understand the importance of health and nutrition for a better society.
5. Present various forms of business writing skills for successful careers.

**UNIT-I:**

**'The Raman Effect'** from the prescribed textbook **'English for Engineers'**

**Grammar** : Articles & Prepositions
**Reading** : Reading and Its Importance- Techniques for Effective Reading.
**Writing** : Organizing principles of paragraphs in documents.
**Vocabulary** : The concept of word Formation, synonyms, antonyms, and standard abbreviations.

**UNIT-II:**

**'Ancient Architecture in India'** from the prescribed textbook **'English for Engineers'**

**Reading** : Improving Comprehension Skills – Techniques for good comprehension
**Writing** : Sentence Structures, Use of phrases and clauses in sentences Writing Formal Letters - Eg. Letter of Complaint, Letter of Requisition, Job Application with Resume.
**Vocabulary** : Root words and acquaintance with prefixes and suffixes from foreign languages in English, to form derivatives

**UNIT-III:**

**'Blue Jeans'** from the prescribed textbook **'English for Engineers'**

**Grammar** : Tenses: Types and uses.
**Reading** : Sub-skills of Reading- Skimming and Scanning
**Writing** : Identifying Common Errors in Writing Subject-Verb agreement in number, gender and person Information Transfer-Process writing.

**UNIT-IV:**

**'What Should You Be Eating'** from the prescribed textbook **'English for Engineers'**

**Reading :** Intensive Reading and Extensive Reading
**Writing** : Nature and Style of Sensible Writing Describing & Defining Identifying common errors in writing

**UNIT-V:**

**'How a Chinese Billionaire Built Her Fortune'** from the prescribed textbook **'English for Engineers'**

**Vocabulary** : Technical Vocabulary and their usage
**Reading** : Reading Comprehension-Exercises for Practice
**Writing** : Cohesive Devices Précis 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. English for Engineers, Sudarshana, N.P. and Savitha, C. Cambridge University Press, 2018.

**Reference Books:**


1. Effective Technical communication, Muhammed Rizvi, TMH, 2008.
2. Advanced English Grammar, Hewings, Cambridge University Press, 2010.

## ENGLISH COMMUNICATION SKILLS LAB

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**I Year II Semester**

**Course Outcomes:**

1. Understand the variants in pronunciation.
2. Identify the diverse purposes of listening and speaking.
3. Discuss ideas in diverse communicative settings.
4. Exhibit increased confidence in public speaking.
5. Display critical thinking, problem solving and decision making skills through GD's

**Exercise-I:**
**CALL Lab:**
Common Indian Variants in Pronunciation – Differences between British and American Pronunciation.
**ICS Lab:**
Spoken vs. Written language-Formal and Informal English- Introducing Oneself and Others.

**Exercise-II:**
**CALL Lab:**
Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.
**ICS Lab:**
Features of Good Conversation – Strategies for Effective Communication Role-Play- Making Requests and Seeking Permissions - Telephone Etiquette.

**Exercise-III:**
**CALL Lab:**
Information Transfer.
**ICS Lab:**
Descriptions-Narrations-Giving Directions and Guidelines-Giving Instructions-Seeking Clarifications-Asking for and Giving Directions-Thanking and Responding-Agreeing and Disagreeing-Seeking and Giving Advice-Making Suggestions.

**Exercise-IV:**
**CALL Lab:**
Past Tense Marker and Plural Marker.
**ICS Lab:**
Public Speaking- Exposure to Structured Talks - Non-verbal Communication- Making a Short Speech – Extempore.

**Exercise-V:**
**CALL Lab:**
Intonation- Sentence Stress -Weak Forms and Strong Forms.
**ICS Lab:**
Group Discussion, Mock Group Discussion sessions

**Reference Books:**


1. A Textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan Publishers, 2010.
2. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.

## PROGRAMMING FOR PROBLEM SOLVING-II

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

**I Year II Semester**

**Course Outcomes:**

1. Identify various string handling functions in 'C'.
2. Develop programs with user defined data types.
3. Use Dynamic memory allocation functions with pointers.
4. Distinguish between Stacks and Queues.
5. Analyze various Dynamic Data Structures.

**UNIT – I:**
Overview of Arrays and Functions.
**Strings:** Introduction to Strings, String I/O, String Operations with and without built-in functions (strlen( ), strcmp( ), strcat( ),strcpy( ) and strrev( )).

**UNIT -II:**
**Structures:** Definition and Initialization of Structures, Accessing structure members, Nested Structures, Array of Structures, Structures and Functions, Unions, typedef, Enumerated Data types.

**UNIT-III:**
**Pointers:** Introduction to Pointers, Pointer Arithmetic, Pointers and Arrays, Pointer to Structure, Pointers and Strings, Parameter passing mechanism: Call by Reference, Pointer to Pointer, Dynamic Memory Allocation.

**UNIT-IV:**
**Introduction to Data Structures:** Lists and Operations, Linear and Non linear Data structures.
**Stacks-** Introduction to Stacks, Operations, Implementation of Stack using Arrays.
**Queues-** Introduction to Queues, Operations, Implementation of Queue using Arrays.

**UNIT-V:**
**Linked Lists:** Introduction to Linked List, Operations on Single Linked List (search, Insertion & Deletion).
**Files:** Introduction to Files, File Operations (Open, Close, read & Write).

**Textbooks:**


1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A.Forouzon and R.F. Gilberg, Third edition, 2016.
2. C and Data Structures, Ashok N. Kamthane, Pearson Education.


**Reference Books:**


1. Problem Solving Using C, M.T. Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition, University Press.
3. Programming in C 2/e, PradipDey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers, Rajaraman V., 4th Edition, Prentice Hall of India, 2006.
5. Programming in C, R S Bichker, University Press, 2012.

## PROGRAMMING FOR PROBLEM SOLVING LAB – II

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**I Year II Semester**

**Course Outcomes:**

**1.** Build programs on various string handling functions.
**2.** Develop applications on user defined data types.
**3.** Apply dynamic memory allocation through pointers.
**4.** Implement linear data structures through stacks and queues.
**5.** Create linked list dynamically through stacks and queues.

**Week 1:**
Programs on Arrays and Functions. (Minimum 3 Programs)

**Week 2 & 3:**
Programs on Strings with and without string built-in Functions. (Minimum 6 Programs)

**Week 4:**
Programs on Accessing Structures and Nested Structures. (Minimum 3 Programs)

**Week 5 & 6:**
Programs on Array of Structures, Structures and Functions. (Minimum 5 Programs)

**Week 7:**
Programs on Unions, typedef and enum. (Minimum 4 Programs)

**Week 8:**
Programs on Pointers, pointer arithmetic, pointer expression, One Dimensional and Two dimensional arrays. (Minimum 4 Programs)

**Week 9:**
Programs on Pointer to structure, Call by Reference, Pointer to Pointer. (Minimum 3 Programs)

**Week 10:**
Programs on Dynamic Memory Allocation Functions. (Minimum 3 Programs)

**Week 11:**
Programs on Stacks and Queues using Arrays.

**Week 12 & 13:**
Programs on Single Linked List.

**Week 14 & 15:**
Programs on File Operations. (Minimum 6 Programs)

**Week 16:**
Review.

## ENGINEERING WORKSHOP

**I Year II Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 1 | 3 | 2.5 |

**Course Outcomes:**

1. Understanding the tools and methods of using to fabricate engineering components
2. Applying the measuring techniques to verify the dimensional accuracy
3. Evaluating various methods and trades of workshop in the component building

**(i) Lectures & videos:**
**Detailed contents**

1. Manufacturing Methods- Metal Forming, Machining, Advanced manufacturing methods (2 lectures)
2. CNC machining, Additive manufacturing (2 lectures)
3. Fitting operations & power tools (1 lecture)
4. House wiring (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding (1 lecture)
7. Metal casting (1 lecture)
8. Welding (1 Lecture)

**(ii) Workshop Practice:**
**Detailed contents:**

1. Machine shop (Lathe machine)
2. Fitting shop
3. Carpentry
4. House Wiring
5. Welding shop (Arc welding )
6. Tin Smithy

**Reference Books:**


1. Elements of Workshop Technology, Hajra Choudhury S.K., Hajra Choudhury A.K. Nirjhar Roy S.K., Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Manufacturing Engineering and Technology, Kalpakjian S. And Steven S. Schmid, 4th edition, Pearson Education India Edition, 2002.

## COURSE STRUCTURE FOR B.TECH II YEAR

**II B.Tech I Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | BS-1 | Complex Analysis and Fourier Transforms | 3 | 0 | 0 | 3.0 |
| 2. | ES-1 | OOP Through JAVA | 3 | 0 | 0 | 3.0 |
| 3. | PC-1 | Electronic Devices and Circuits | 3 | 0 | 0 | 3.0 |
| 4. | BS-2 | Probability Theory and Stochastic Processes | 3 | 0 | 0 | 3.0 |
| 5. | PC-2 | Signals and Systems | 3 | 0 | 0 | 3.0 |
| 6. | PC – 3 | Network Analysis and Transmission Lines | 3 | 0 | 0 | 3.0 |
| 7. | PC Lab-1 | Electronic Devices and Circuits Laboratory | 0 | 0 | 2 | 1.0 |
| 8. | PC Lab-2 | Basic Simulation Laboratory | 0 | 0 | 2 | 1.0 |
| 9. | MC-1 | Gender Sensitization | 2 | 0 | 0 | 0 |
| | | **Total** | **20** | **0** | **4** | **20** |

**II B.Tech II Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | PC-4 | Switching Theory and Logic Design | 2 | 1 | 0 | 3.0 |
| 2. | ES-2 | Electrical Technology | 3 | 0 | 0 | 3.0 |
| 3. | H&S-1 | Professional Communications | 2 | 0 | 0 | 2.0 |
| 4. | PC-5 | Analog and Digital Communications | 3 | 1 | 0 | 4.0 |
| 5. | PC-6 | Analog and Pulse Circuits | 3 | 0 | 0 | 3.0 |
| 6. | PC-7 | Electromagnetic Waves | 3 | 0 | 0 | 3.0 |
| 7. | PC Lab-3 | Analog & Digital Comm. Laboratory | 0 | 0 | 2 | 1.0 |
| 8. | PC Lab-4 | Analog and Pulse Circuits Laboratory | 0 | 0 | 2 | 1.0 |
| 9. | MC-2 | Environmental Science | 2 | 0 | 0 | 0 |
| | | **Total** | **18** | **2** | **4** | **20** |

## COMPLEX ANALYSIS AND FOURIER TRANSFORM

**II Year I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

1. Work with the functions of complex variables and evaluation of complex differentiation.
2. Acquire the knowledge of complex power series and integration.
3. Apply the knowledge of contour integration to evaluate real integrals in engineering problems and acquire the knowledge of evaluating of conformal mapping and bilinear transformations.
4. Studying of Fourier series and defining it for various types of functions.
5. Apply Fourier sine and cosine integral theorems for a given function f(x) evaluate Fourier transforms, sine and cosine transforms.

**UNIT-I:**
**Functions of Complex Variables:**
Introduction, Complex functions - limits and Continuity-Differentiability, Analytic functions and Properties, Cauchy-Riemann Equations (Cartesian and Polar), Harmonic functions, Construction of analytic functions.

**UNIT-II:**
**Complex Integration:**
Introduction, Complex integration -Line integral, Cauchy's integral theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Power series: Taylor's series, Laurent series, Singular points, Types of Singularities, Residue, Cauchy's Residue theorem.

**UNIT-III:**
**Evaluation of Integrals & Conformal Mapping:**

Introduction, Evaluation of improper real integrals of the type (a) $\int_{\infty}^{\infty} f(x)dx$

(b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$ -Conformal Mapping, -Critical Points-Bilinear transformation – fixed point – cross ratio - properties - invariance of circles.

**UNIT-IV:**
**Fourier series:**
Introduction- Periodic functions- Fourier series of periodic function- Dirichlet's conditions- Even and odd functions- Change of interval- Half-range sine and cosine series.

**UNIT-V:**
**Fourier Transforms:**
Introduction- Fourier integral theorem (without proof)- Fourier integrals in complex form- Standard results- Fourier sine and cosine integrals- Fourier Transforms- Infinite and finite Fourier Transforms- Properties- Fourier sine and cosine transforms- inverse transforms, Finite Fourier transforms.

**Textbooks:**

1. Higher Engineering Mathematics, Grewal B S, Khanna Publishers, 2014.
2. A text book of Engineering Mathematics, Bali N P, Manesh Goyal, Laxmi Publications, 2011.

**Reference Books:**


1. Advanced Engineering Mathematics, Erwin Kreyszig, Herbert Kreyszig, Edward J. Norminton, Wiley, 2011
2. Fundamentals of Complex Analysis, Saff E B, Arthur David Snider, Pearson, 1993.
3. Functions of Complex Variables, Sharma J N , Prakashan, 1991.

**OBJECT ORIENTED PROGRAMMING through JAVA**

**II B.Tech I Semester**

| L | T | P | C |
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| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Able to solve real world problems using OOP techniques.
2. Able to understand the use of abstract classes.
3. Able to solve problems using inheritance, polymorphism.
4. Able to develop multithreaded applications with synchronization.
5. Able to handle run time errors while applying exception handling

**Unit-I:**
**Fundamentals of Object Oriented Programming:**
Object-Oriented Paradigm, Basic Concepts of Object Oriented Programming- Objects and Classes, Data abstraction and encapsulation, inheritance, Polymorphism, Data binding, Message Communication, Benefits of OOP, Applications of OOP.

**Java Basics:**
History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and type casting, simple java program.

**Unit-II:**
**Concepts of classes and objects:**
Classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, Strings.

**Unit-III:**
**Inheritance:**
Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, Objectclass.

**Unit-IV:**
**Packages**:
Defining a Package, CLASSPATH, Access protection, importing packages.

**Interfaces:**
Defining an interface, implementing interfaces, variables in interfaces and extending interfaces.
**Stream based I/O (java.io):**
The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, The Console class, Serialization, Enumerations, auto boxing, generics.

**Unit V:**
**Exception handling:**
Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

**Multithreading:**
Difference between multitasking and multithreading, Thread Lifecycle, Thread class, Runnable interface, Thread priorities, Daemon threads

**TEXTBOOKS:**

1. Herbert Schildt , The Complete Reference Java, Tata Mc Graw Hill, 2002
2. Budd T , Understanding Object Orient Programming with Java, Pearson.2002

**REFERENCE BOOKS:**

1. Jaime Nino, Frederick A. Hosch, An Introduction to programming and object oriented design using java, Wiley, 2009
2. Budd T, An Introduction to Object Orient Programming, Pearson, 2008
3. Daniel Liang Y, Introduction to JAVA Programming comprehensive Programming, Pearson, 2014.

## ELECTRONIC DEVICES AND CIRCUITS

**II B.Tech I Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Demonstrate the concepts of semiconductor theory.
2. Interpret the characteristics of different semiconductor devices with its applications.
3. Apply different biasing techniques of transistors for amplification.
4. Analyze transistor amplifiers using small signal model.
5. Ability to describe the behavior of special purpose diodes.

**UNIT I:**

**Diode:**

PN junction Diode – Characteristics, Current equation, Temperature dependence, Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances,

**Diode Applications:**

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive Filter, Clippers, Clampers.

**UNIT II:**

**Bipolar Junction Transistor (BJT):**

Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.

**UNIT III:**

**Transistor Biasing and Stabilization:**

Bias Stability, Fixed Bias, and Collector to Base bias, Self-Bias, Bias compensation using Diodes and Transistors.

**Analysis and Design of Small Signal Low Frequency BJT Amplifiers:**

Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

**UNIT IV:**

**Junction Field Effect Transistor:**

Construction, Principle of Operation, Pinch-Off voltage, Volt-Ampere characteristic, comparison of BJT and FET, Biasing of FET, FET as voltage variable resistor, MOSFET construction and its characteristics in enhancement and depletion modes.

**UNIT V:**

**FET Amplifiers:**

Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers. Basic Concepts of MOSFET Amplifiers.

**Special Purpose Devices:**

Zener Diode - Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

**TEXTBOOKS:**

1. Millman & Halkias, Electronic devices and circuits, McGraw Hill , 2007
2. Boylestad R L & Louis Nashelsky Electronic Devices and Circuits, Prentice Hall India, 2006.

**REFERENCES:**

1. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj , Electronic Devices and Circuits, Tata Mc Graw Hill , 2008.
2. Gupta J B, Electronic Devices and Circuits, S. K. Kataria, 2009
3. Lal Kishore K, Electronic Devices and Circuits, BSP , 2005

# PROBABILITY THEORY AND STOCHASTIC PROCESSES

**II B.Tech I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

After going through this course the student will be able to

1. Demonstrate knowledge in Probability theory, Single and multiple random variables and Random processes and their characteristics
2. Analyze operations on single and multiple random variables and processes.
3. Compute Simple probabilities using an appropriate sample space, Expectations from probability density functions, Least-square & maximum likelihood estimators for engineering problems mean and Covariance functions for simple random processes.
4. Designsolutionsforcomplexengineeringproblemsinvolvingrandomprocesses.
5. Understand how random variables and stochastic processes can be described and analyzed

**UNIT-I:**
**Probability & Random variables:**
**Probability:**
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, 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 and more Random Variables, Central Limit Theorem, Equal and UnequalDistribution. Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions

**UNIT-III:**
**Random processes – Temporal characteristics:**
The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide- Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross- Correlation Function and Its Properties,RandomSignalResponseofLinearSystems:SystemResponse–Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

**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. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

**UNIT-V:**

**Noise sources:**

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

**TEXT BOOKS:**


1. Peyton Z. Peebles, Probability, Random Variables & Random Signal Principles, Tata McGraw Hill, 2001.
2. Taub and Schilling , Principles of Communication systems , Tata McGraw Hill,2008


**REFERENCE BOOKS:**


1. Athanasios Papoulis and S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes, Prentice Hall India, 2002.
2. Murugesan K, Guruswamy P, Probability, Statistics & Random Processes, Anuradha Publications, 2003.
3. Lathi B P, Signals, Systems & Communications, B.S. Publications, 2003.

# SIGNALS AND SYSTEMS

**II B.Tech I Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Understand the Mathematics, operations and classification of signals and systems
2. Apply the transform on standard and arbitrary signals
3. Infer the signal transmission through linear systems
4. Interpret the concepts of sampling and role of Z-Transform in analysis of systems.
5. Understand the process of sampling and the effects of under sampling.

**UNIT I:**
**Signal Analysis:**
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, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

**UNIT-II:**
**Fourier series & Fourier Transforms:**
Representation of Fourier series, Continuous time periodic signals - Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.
Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal - standard signals - Periodic Signals – Properties - 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.

**UNIT IV:**
**Laplace Transforms:**
Laplace Transforms (L.T), Inverse Laplace Transform, and Concepts 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.

**UNIT-V:**
**Sampling Theorem and Z–Transforms:**
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 PassSampling.
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 ofZ-transforms.

**TEXT BOOKS:**


1. Lathi B P, Signals, Systems & Communications, B.S. Publications, 2003.
2. Alan V. Oppenheim, Alan S. Willsky, Syed Hamid Nawab, Signals and Systems, Prentice Hall India, 1997.


**REFERENCE BOOKS:**


1. Simon S. Haykin, Barry Van Veen , Signals and Systems, Wiley, 2003
2. Rama Krishna Rao A, Signals and Systems, 2008, Tata McGraw Hill, 2008.
3. Deergha Rao K, Signals and Systems, Springer, 2018.

## NETWORK ANALYSIS AND TRANSMISSION LINES

**II B.Tech I Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Recite basic concepts of network parameters, theorems and transmission line theory.
2. Differentiate the changes of transient networks using Laplace transform
3. Compare and contrast the parameters, functions and synthesis of the network
4. Apply the concepts of theorems on networks and transmission line theory to solve impedance matching issues.
5. Solve the transmission lines and matching circuits problems using Smith chart

**UNIT-I:**

**Network Theorems:**

Source transformation - Superposition Theorem - Thevenin's theorem - Norton's theorem - Reciprocity theorem - Maximum power transfer theorem

**UNIT-II:**

**Transient Analysis:**

Transient response of RL, RC, RLC Circuits (Series and Parallel combinations) for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method. Transient response for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method.

**UNIT – III:**

**Two Port Networks:**

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, ***g*** parameters, Conversion of one of Parameter to another, Conditions for Reciprocity and Symmetry, Inter Connection of Two Port networks in series, Parallel and Cascaded configurations, Image Parameters, Illustration problems.

**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.

**TEXT BOOKS:**

1. Van Valken Burg, Network Analysis, Pearson, 2016
2. Ryder J D, Networks, Lines and Fields, Prentice Hall India, 1999.

**REFERENCE BOOKS:**

1. Edminister J and Nahvi, Electric Circuits, Mcgraw Hill, 1999.
2. William Hayt and Jack E Kemmerly, Engineering Circuit Analysis, Tata Mcgraw Hill, 1993.
3. John Kraus and Daniel Fleisch, Electromagnetics with Applications, Tata Mcgraw Hill, 2017.

## ELECTRONIC DEVICES AND CIRCUITS LABORATORY

**II B.Tech I Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Identify and use the basic components and instruments in electronics laboratory
2. Outline the characteristics of different semiconductor devices.
3. Interpret the ripple factor, regulations of rectifiers.
4. Sketch the frequency response of small signal amplifiers.
5. Understand the concepts of SCR & UJT and observe its characteristics.

**PART A:**

**(Only for Viva-voce Examination):**
**Electronic Workshop Practice (In 3 Lab Sessions):**

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards and PCBs
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, Low power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, SCR and UJT.
3. Study and operation of
    a. Multimeters (Analog and Digital)
    b. Function Generator
    c. Regulated Power Supplies
    d. CRO.

**PART B:**
**(For Laboratory Examination – Minimum of 12 experiments):**

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
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 & Output Characteristics of Transistor in CB Configuration and h-parameter calculations.
6. Input & Output Characteristics of Transistor in CE Configuration and h-parameter calculations.
7. FET characteristics.
8. Lissajous patterns using CRO
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier.
12. SCR characteristics.
13. UJT Characteristics
14. Clippers
15. Clampers

## BASIC SIMULATION LABORATORY

**II B.Tech I Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Evaluate the operation on signals and systems using arithmetic operations and transforms
2. Application of correlation and transforms on noise removal and signal extraction
3. Compute various statistical properties of a random noise and verify whether it is stationary
4. Determine the correlation & Convolution between Signals and sequences.
5. Validate the properties and waveform synthesis of various transforms

**Minimum 12 experiments to be Simulated Using MATLAB:**

1. Generation of various signals and sequences (Periodic and A periodic), such as Unit Impulse, Unit step, square, saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Operations on Signals and Sequences such as Addition, multiplication, scaling, Shifting, Folding, computation of Energy and average power.
3. Finding the Even and Odd parts of Signal/sequence and Real and imaginary parts of signal.
4. Convolution between signals and sequences.
5. Auto correlation and cross correlation between signals and sequences.
6. Verification of Linearity and Time Invariance Properties of a given continuous/Discrete system.
7. Gibbs Phenomenon.
8. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
9. Waveform synthesis using Laplace Transform.
10. Locating the Zeros and Poles and plotting the Pole-Zero maps in S plane and Z-plane for the given transfer function.
11. Generation of Guassian noise (Real and complex), Computation of its mean, M.S. value and its Skew, Kurtosis, and PSD, probability distribution function.
12. Sampling Theorem Verification.
13. Removal of noise by Autocorrelation / Cross correlation.
14. Extraction of Periodic signal masked by noise using correlation.

## GENDER SENSITIZATION

**II Year I Semester**

| L | T | P | C |
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**Course Outcomes:**

1. To develop awareness about gender discrimination and take measurable steps to counter it.
2. To identify the basic dimensions of biological, sociological, psychological and legal aspects of gender.
3. To acquire knowledge about gendered division of labour in relation to politics and economics.
4. To prepare the students against gender violence.
5. To prepare the students to work and live together as equals.

**UNIT-I:**

**Understanding Gender:**

**Gender:**

Why Should We Study It?

**Socialization:**

Making Women, Making Men Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

**UNIT-II:**

**Gender and Biology:**

**Missing Women:**

Sex Selection and Its Consequences Declining Sex Ratio. Demographic Consequences.

**Gender Spectrum:**

Beyond the Binary Two or Many? Struggles with Discrimination.

**UNIT-III:**

**Gender and Labour:**

**Housework:**

The Invisible Labour "My Mother doesn't Work." "Share the Load."

**Women's Work**:

Its Politics and Economics Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

**UNIT-IV:**

**Issues of Violence:**

**Sexual Harassment:**

Say No! Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

**Domestic Violence:**

Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

**UNIT-V:**

**Gender: Co- Existence**

**Just Relationships:**

Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

**Textbooks:**

1. **Towards a World of Equals: A Bilingual Textbook on Gender**, A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote,Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, **Telugu Akademi**, **Hyderabad**, Telangana State, **2015**.

**Reference Books:**

1. Seeing like a Feminist, Menon, Nivedita, New Delhi, Zubaan, Penguin Books, 2012.
2. I Fought For My Life…and Won, Abdulali Sohaila.

## SWITCHING THEORY AND LOGIC DESIGN

**II B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Demonstrate the basic theorems of Boolean algebra, logic gates, combinational and sequential circuits and memories.
2. Analyze the combinational and sequential circuits and memories.
3. Design of logic circuits
4. Realization of gates using different logic families.
5. Explain the design and operation of different semiconductor memories

**Unit-I:**
**Number System and minimization techniques:**
**Number System:**
Review of number system and base conversion, complements, signed binary numbers, Floating point number representation, Error detection (parity detection only).
**Minimization techniques**
Boolean Algebra, postulates ,basic logic gates, Canonical and Standard Form, NAND and NOR implementation, Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Tabular Method.

**UNIT-II:**
**Combinational Circuits:**
Adders & Subtractor, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparators, Multiplexers, De-multiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.

**UNIT-III:**
**Sequential circuits-I:**
Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

**Unit-IV:**
**Sequential Circuits-II:**
Synchronous – Asynchronous – Comparison, Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register, MOD Counters. Finite state machine-capabilities and limitations, Mealy and Moore models.

**UNIT-V:**
**Logic Families and Semiconductor Memories:**
**Logic Families:**
DCTL, RTL, DTL, TTL and CML Logic –gate realization - Comparison,
**Semiconductor Memories:**
Introduction to ROM, PAL, PLA, CPLD, FPGA.

**TEXT BOOKS:**

1. Zvi Kohavi & Niraj K. Jha, Switching and Finite Automata Theory, Cambridge, 2010.
2. Jain N P, Modern Digital Electronics, Tata McGraw Hill, 2007.

**REFERENCE BOOKS:**

1. Morris Mano , Digital Design, Prentice Hall India, 2006
2. Fredriac J. Hill, Gerald R. Peterson, Introduction to Switching Theory and Logic Design Wiley, 1981.
3. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 2004.

**ELECTRICAL TECHNOLOGY**
**(B. Tech. Electronics and Communication Engineering)**

**II Year B. Tech II semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the concept of network topology
2. Apply the concepts of the filters, attenuators to real-world problems.
3. Able to synthesize the electrical networks using different techniques.
4. Analyse the basic concepts of DC machines & AC Machines.
5. Understand the basic concepts of some special machines.

**UNIT I:**
**Network topology:**
Definitions, Graph, Tree, Basic cutest and Basic Tie set Matrices for Planar Networks, Loop and Nodal methods for analysis of Networks with Dependent & Independent Voltage and Current Sources, Duality & Dual Networks.

**UNIT II:**
**Filters and attenuators:**
**Filters:**
Classification of Filters, Filter Network, Classification of Pass band and Stop Band, Characteristic Impedance in the Pass and Stop bands, Constant-k Low Pass Filter, High Pass Filter, m-derived T-Section, Band Pass Filter and Band Elimination filter, Illustrative problems. Attenuators: T-Type Attenuator, p-Type Attenuator, Bridged T-Type Attenuator, Lattice Attenuator.

**UNIT III:**
**Network synthesis:**
Reliability Concept, Hurwitz Property, Positive Realness, Properties of positive real functions, Synthesis of R-L, R-C and L-C driving point functions, Foster and Cauer forms.

**UNIT IV:**
**Dc generators and dc motors:**
**DC Generators:**
Principle of Operation, EMF equation, Introduction to armature reaction and commutation, Types of Generators, Magnetization (OCC) characteristics - critical field resistance and critical speed, Applications.
**DC Motors:**
Principle of operation - Back E.M.F. - Torque equation, Types of DC Motors, Losses and Efficiency, Brake Test, Speed control of DC Motor - Flux and Armature Voltage control methods, Applications.

**UNIT V:**
**Special machines:**
Synchros, Principles of operation of Reluctance Motors, Stepper Motors, Universal Motors, Permanent magnet Brushless DC Motors

**TEXT BOOKS:**
1. Chakrabarti A, Circuit Theory: Analysis & Synthesis, Dhanpat Rai & Sons, 2008.
2. Gupta J B, Theory and performance of Electrical machines, S K Kataria, 2009.

**REFERENCE BOOKS:**


1. William Hayt, Jack Kemmerly, Jamie Phillips and Steven Durbin, Engineering Circuits Analysis, McGraw Hill Company, 2019.
2. Bimbra P S, Electric Machinery-, Khanna Publishers, 2010
3. Bhatta Charya S K, Electrical Machines, McGraw Hill Companies, 2007.

## PROFESSIONAL COMMUNICATION

**II Year II Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

**Course Outcomes:**

1. Acquire enhanced personality
2. Exhibit appropriate professional etiquette
3. Practice team building with strong communication skills
4. Develop problem solving skills and decision-making
5. Demonstrate effective presentation skills

**UNIT-I:**

**Self-Appraisal:**

Self-Introspection/ Self Retrospection
Introducing self & others
Goal setting
SWOT Analysis,

**UNIT- II:**

**Professional Etiquette:**

Etiquette-Telephone Etiquette- Netiquette
Email, Social Network
Behavioural Traits
Case study

**UNIT-III:**

**Team Building:**

Leadership skills-Case Studies
Team Essentials
Negotiation Skills
Group Discussion-Functional Aspects

**UNIT-IV:**

**Logical Thinking and Analytical Reasoning:**

Decision Making
Problem Solving
Conflict management
Case Study

**UNIT-V:**

**Presentation Skills:**

Poster Presentation
Oral Presentation-Individual Presentation, Team Presentation, Thematic Presentation

**Textbooks:**

1. Effective Technical Communication, Ashrif Rizvi, Tata Mc Graw Hill, 2011

**Reference Books:**

1. Speaking and Writing for Effective Business, Soundarajan, Mcmillan, 2010.
2. English for Professional Success, Hector Sanchez, Thomson, 2010.

## ANALOG AND DIGITAL COMMUNICATIONS

**II B.Tech II Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

After going through this course the student can

1. Demonstrate fundamental knowledge in Elements of Analog and Digital Communication systems.
2. Analyze different types of analog and digital modulation systems and calculate total power & bandwidth.
3. Design an efficient Transmitter and Receiver based on SNR, bandwidth and equipment complexities.
4. Formulate and solve engineering problems in the core area of analog and digital communications in developing information transmitting systems and telemetry system.
5. Illustrate the impact of noise in analog communication systems and computation of Probability of error in digital modulation techniques.

**UNIT-I:**

**Amplitude Modulation:**

Review of signals and systems, Amplitude Modulation: Time and Frequency domain representations Power and Bandwidth, AM Generators: Square law modulator Switching modulator, AM Detectors: Square law detector Envelope detector, DSBS Modulation: Time domain and frequency domain representations, DSB-SC Generators: Balanced Modulators Ring Modulator, DSB-SC Detectors: Coherent detector COSTAS Loop, SSB Modulation: Time and Frequency domain representations SSB Generators and Detectors, VSB Modulation: Time and Frequency domain representation Envelope detection of a VSB wave, Comparison and Applications of different AM Systems, Frequency Division Multiplexing.

**UNIT-II:**

**Frequency Modulation:**

Angle Modulation: Time domain representation - Single tone FM wave - NBFM and WBFM - Spectral analysis of single tone FM Wave - Power and Bandwidth, FM Generators: Indirect FM and Direct FM Generators, FM Detectors: Balanced Frequency discriminator - Ratio detector, Pre-emphasis & De-emphasis, Threshold effect, Comparison of FM between AM.

**UNIT-III:**

**Pulse and Base Band Digital Modulations:**

**Pulse Analog Modulation:**

Sampling process, Pulse Amplitude Modulation and Demodulation, Pulse Width Modulation and demodulation, Pulse Position Modulation and Demodulation, Time Division Multiplexing.

**Pulse Digital Modulation:**

Quantization process, Pulse Code Modulation (PCM), Differential PCM (DPCM), Delta Modulation (DM), Inter Symbol Interference (ISI) - Nyquist criterion, Optimal detection of digital signals

**UNIT-IV:**
**Pass band Digital Modulations:**
**Pass-band Digital Modulation Schemes:**
ASK – PSK – DPSK - FSK – QAM, Probability of error, Optimal Coherent detection of PSK and FSK

**UNIT-V:**
**Noise in Communication Systems:**
Output SNR& Noise Figure in Analog modulation systems: AM – DSBSC - SSB - FM, Output SNR in PCM and DM systems, Comparison of PCM and DM systems.

**TEXT BOOKS:**


1. Haykin S, Communications Systems, Wiley, 2001.
2. Sam Shanmugam, Digital and Analog Communication Systems, Wiley, 2006.


**REFERENCE BOOKS:**


1. Proakis J G, Digital Communications, McGraw Hill, 2000.
2. Wozencraft J M & Jacobs I M, Principles of Communication Engineering, Wiley, 1965.
3. Simon Haykin, Digital communications, Wiley, 2005.

## ANALOG AND PULSE CIRCUITS

**II B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Understand the concepts of amplifiers, feedback, large signal model and time base generators.
2. Utilize the Concepts of feedback to improve the stability in amplifiers and oscillators.
3. Analyze different multistage amplifiers, multivibrators and time base generators.
4. List different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications
5. Design RC and LC Oscillators for different frequencies and analyze them for frequency and amplitude stability.

**UNIT I:**

**Multistage Amplifiers:**

Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage cascade amplifiers, Cascode amplifier, Darlington pair.

**Transistor at High Frequency:**

Hybrid - model of Common Emitter transistor model, $f\alpha$, $\beta$ and unity gain bandwidth, Gain bandwidth product.

**UNIT II:**

**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.

**UNIT III:**

**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, Frequency and amplitude stability of 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:**

Single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

**UNIT V:**

**Multivibrators:**

Analysis and Design of AstableMultivibrators,Types of Triggering, MonostableMultivibrators, BistableMultivibrators 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, Methods of Linearity improvement

**TEXT BOOKS:**


1. Jacob Millman, Christos C Halkias , Integrated Electronics, , McGraw Hill, 2010
2. Millman J, Taub H and Mothiki S. Prakash Rao, Millman's Pulse, Digital and Switching Waveforms, Tata McGraw Hill, 2008.


**REFERENCE BOOKS:**


1. David A. Bell, Electronic Devices and Circuits, Oxford, 1986.
2. Robert L. Boylestead, Louis Nashelsky, Electronic Devices and Circuits theory, Pearson, 2009.
3. Thomas L. Floyd, Electronic Devices Conventional, Pearson, 2015.

## ELECTROMAGNETIC WAVES

**II B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Demonstrate the EM Field Characteristics – divergence and curl of fields
2. Interpret the Maxwell's equations for static Electric and Magnetic fields and dynamic Electromagnetic fields
3. Analyze the behavior of EM waves in different media
4. Apply the knowledge of EM Wave Propagation at microwaves
5. Explain the wave equations and mode analysis of rectangular and circular wave guides

**UNIT I:**
**Electrostatics:**
Introduction to coordinate system- Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relation 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, Capacitors – Parallel Plate, Coaxial, Spherical.

**UNIT II:**
**Magneto statics:**
Biot-Savart's Law, Ampere's Circuit Law and Applications, Magnetic Flux Density, Maxwell's two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

**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.

**UNIT IV:**
**EM Wave Characteristics:**
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. 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.

**UNIT V:**
**Waveguides:**
Electromagnetic Spectrum and Bands. Rectangular Waveguides – Solution of Wave Equationsin Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, CharacteristicEquation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TMmode fields in the cross-section, Phase and Group Velocities, Wavelengths and ImpedanceRelations, Equation of Power Transmission, Impossibility of TEM Mode. Microstrip Lines – ZoRelations, Effective Dielectric Constant, Circular waveguides.

**TEXT BOOKS:**


1. William H. Hayt & John A. Buck, Engineering Electromagnetics, McGrawHill, 2014
2. Matthew N.O. sadiku and S.V. Kulkarni, Principles of Electromagnetics, Oxford University Press, 2015.


**REFERENCE BOOKS:**


1. Jordan E C and Balman K G, Electromagnetic Waves and Radiating Systems, Prentice Hall India, 2000.
2. Nathan Ida, Engineering Electromagnetics, Springer, 2005.
3. Bhag Singh Guru and Huseyin R. Hiziroglu, Electromagnetic Field Theory Fundamentals, Cambridge University Press, 2006.

## ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

**II B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Demonstrate knowledge in different Analog and Digital Communication Systems.
2. Compare the characteristics of various Analog and Digital modulation schemes and analyze their performances.
3. Develop various analog and digital modulation and demodulation systems
4. Explain how Pulse code modulation is applied to transform an analog signal into a digital one and transmitted through the digital communication network.
5. Design the shift keying based digital modulation techniques for the transmission of digital information

**Note: Any 10 experiments to be conducted**

1. Amplitude modulation and demodulation
2. DSBSC modulation and demodulation
3. SSB modulation and demodulation
4. Frequency modulation and demodulation
5. Pulse Amplitude Modulation and demodulation
6. Pre-emphasis and De-emphasis
7. Verification of Sampling Theorem
8. Pulse code modulation and demodulation
9. Delta modulation and demodulation
10. PSK Modulation and demodulation
11. FSK Modulation and demodulation
12. DPSK and QPSK Modulation and demodulation

## ANALOG AND PULSE CIRCUITS LABORATORY

**II B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**COURSE OUTCOMES:**

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

1. Compare the frequency response of tuned, MOS, Darlington amplifier.
2. Sketch the sustained waveforms of oscillators, multi-vibrators and sweep circuits.
3. Interpret the efficiency of power amplifiers.
4. Explain the characteristics of Boot strap sweep circuit, Miller sweep circuit and UJT relaxation oscillator
5. Design LC Oscillators for different frequencies and analyze them for frequency and amplitude stability.

**Note: Any 12 experiments to be conducted**

1. Class A Power Amplifier (With Transformer Load)
2. Class C Power Amplifier
3. Single Tuned Voltage Amplifier
4. Hartley Oscillators
5. Colpitts Oscillators
6. Darlington Pair
7. MOS Amplifier
8. Design a Bistable Multi vibrator and draw its waveforms
9. Design aMonostable Multi vibrator and draw its waveforms
10. Design an Astable Multi vibrator and draw its waveforms
11. Response of Schmitt Trigger circuit for loop gain less than and greater one
12. The output – voltage waveform of Boot strap sweep circuit
13. The output – voltage waveform of Miller sweep circuit
14. UJT relaxation oscillator

**ENVIRONMENTAL SCIENCE**
**(Common to all Branches)**

**II B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 0 |

**COURSE OUTCOMES:**

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

1. Define and explain the structure and functions of ecosystem, value of biodiversity, threats and conservation of biodiversity.
2. Explain the limitations of the resources and impacts of over utilization of all natural resources.
3. Explain the sources and effects of environmental pollutions and list the available techniques to control the pollution.
4. Explain the global environmental issues like climate change, ozone hole and can explain the scope of EIA, Environmental Management Plan, environmental audit and list the EIA methods.
5. Mention the salient features of environmental acts and rules, define the sustainable goals along with measures required for the sustainability.

**UNIT- I:**
**Ecosystem:**
Definition, Scope and Importance of ecosystem, Structure and Functions of ecosystem: Food chains, Food Web and Ecological Pyramids, Flow of energy; Bio-magnification.
**Biodiversity and Biotic Resources:**
Introduction, Definition, levels of Biodiversity, Value of biodiversity, Hot spots of biodiversity, Threats to biodiversity, conservation of biodiversity: In-Situ and Ex-situ conservation.

**UNIT- II:**
**Natural Resources:**
Classification of Resources,
**Water resources:**
Use and over utilization of surface and ground water, Dams: benefits and problems, Rain water harvesting;
**Energy resources:**
Growing energy needs, Renewable and Non Renewable Energy resources.
**Land resources:**
land degradation – Landslide and Soil Erosion;
**Forest Resources:**
Uses and Exploitation.

**UNIT- III:**
**Environmental Pollution and Contro**l:
Types of Pollution, Sources, Effects and Control measures of Air Pollution, Water Pollution, Soil Pollution and Noise Pollution.

**UNIT- IV:**
**Global Environmental Problems and Global Efforts:**
Greenhouse effect, Global Warming, climate change and their impacts on human environment; Ozone depletion and Ozone depleting substances (ODS); Aid Rains.
**Environmental Impact Assessment (EIA):**
Scope of EIA and EIA methods, scope of Environmental audit and Environmental Management Plan.

**UNIT- V:**

**Environmental Policy, Legislation, Rules and Regulations:**

Salient features of Environmental Protection act, Air (Prevention and Control of pollution) Act-1981, Water (Prevention and Control of pollution) Act-1974, Forest Conservation Act, Municipal solid waste, Hazardous waste, E-waste, Bio-medical waste, Radioactive waste Rules.

**Towards Sustainable Future:**

Concept of Sustainable Development, Sustainable goals defined by UN, Threats to Sustainability, Environmental Education, Role of IT in Environment, Smart Cities, Concept of Green Building, Low Carbon Lifestyle, Life cycle assessment and Ecological Foot Print.

**TEXT BOOKS:**


1. Anubha Kaushik, Text Book of Environmental Studies, New age International, 2006.
2. Erach Bharucha, Environmental studies, University Press, 2005.


**REFERENCE BOOKS:**


1. Anji Reddy M, Environmental Science and Technology, B S Publications, 2007
2. Richard T. Wright , Environmental Science: Towards a Sustainable Future, Prentice Hall India, 2008

## COURSE STRUCTURE FOR B.TECH III YEAR

**III B.Tech I Semester:**

| S.No | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | ES – 3 | Control Systems | 3 | 0 | 0 | 3 |
| 2 | PC – 8 | Microprocessors & Microcontrollers | 2 | 1 | 0 | 3 |
| 3 | PC – 9 | Linear & Digital IC Applications | 3 | 0 | 0 | 3 |
| 4 | PC – 10 | Antenna And Propagation | 3 | 0 | 0 | 3 |
| 5 | PE-1 | **Professional Elective-1**<br>1. Computer Architecture<br>2. Information Theory and Coding<br>3. Introduction to Mems | 3 | 0 | 0 | 3 |
| 6 | OE-1 | **Open Elective-1**<br>1. Introduction to Microcontrollers<br>2. Basic Electronics | 3 | 0 | 0 | 3 |
| 7 | PC Lab-5 | Microprocessor and Microcontrollers Laboratory | 0 | 0 | 2 | 1 |
| 8 | PC Lab-6 | Linear & Digital IC App. Laboratory | 0 | 0 | 2 | 1 |
| 9 | MC – 3 | Personality Development & Behavioral Skills | 2 | 0 | 0 | 1 |
| | | **Total** | **19** | **1** | **4** | **21** |

**III B.Tech II Semester:**

| S.No | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | H&S | Managerial Economics & Financial Analysis | 3 | 0 | 0 | 3 |
| 2 | PC-11 | Digital Signal Processing | 2 | 1 | 0 | 3 |
| 3 | PC-12 | Microwave Engineering | 2 | 1 | 0 | 3 |
| 4 | PC-13 | Data Communication and Networking | 2 | 1 | 0 | 3 |
| 5 | PE-2 | **Professional Elective-2**<br>1. Digital Signal Processors and Architectures<br>2. Modelling and Simulation using MATLAB<br>3. Optical Communications | 3 | 0 | 0 | 3 |
| 6 | OE – 2 | **Open Elective-2**<br>1. Basic Electronic Instrumentation<br>2. Consumer Electronics | 3 | 0 | 0 | 3 |
| 7 | PC Lab-7 | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1 |
| 8 | H&S | Adv. Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 9 | MC – 4 | Quantitative Methods & Logical Reasoning | 2 | 0 | 0 | 1 |
| | | **Total Number** | **17** | **3** | **4** | **21** |

## COURSE STRUCTURE FOR B.TECH III YEAR (FAST TRACK)

**III B.Tech II Semester:**

| S.No | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | H&S | Managerial Economics & Financial Analysis | 3 | 0 | 0 | 3 |
| 2 | PC-11 | Digital Signal Processing | 2 | 1 | 0 | 3 |
| 3 | PC-12 | Microwave Engineering | 2 | 1 | 0 | 3 |
| 4 | PC-13 | Data Communication and Networking | 2 | 1 | 0 | 3 |
| 5 | PE-2 | **Professional Elective-2** | 3 | 0 | 0 | 3 |
| | | 1. Digital Signal Processors and Architectures | | | | |
| | | 2. Modelling and Simulation using MATLAB | | | | |
| | | 3. Optical Communications | | | | |
| | **PC-16** | **Fast Track** | | 0 | 0 | |
| 6 | OE – 2 | **Open Elective-2** | 3 | 0 | 0 | 3 |
| | | 1. Basic Electronic Instrumentation | | | | |
| | | 2. Consumer Electronics | | | | |
| 7 | PC Lab-7 | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1 |
| 8 | H&S | Adv. Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 9 | MC – 4 | Quantitative Methods & Logical Reasoning | 2 | 0 | 0 | 1 |
| **Total Number** | | | **17** | **3** | **4** | **21** |

**CONTROL SYSTEMS**
**(B.Tech. Electronics and Communication Engineering)**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**III B.Tech I semester**

**COURSE OUTCOMES:**

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

1. Understand the modeling of linear-time-invariant systems using transfer function.
2. Analyse system response and evaluate error dynamics in time domain.
3. Understand the concept of stability and its assessment for linear-time invariant systems.
4. Design simple feedback controllers.
5. Infer the general concept of state variable, state space and analyse the stability of linear Time discrete systems.

**UNIT I**
**Introduction to control problem:**
Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

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

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

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

**UNIT V:**
**State variable analysis and concepts of state variables:**
State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback.
Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

**TEXT BOOKS:**


1. Nagrath I J & Gopal M, Control Systems Engineering, New Age International, 2009.
2. Kuo B. C, Automatic Control Systems, John Wiley, 2003.


**REFERENCE BOOKS:**


1. Nagoorkani A, Control Systems Engineering, CBS PUB & DIST, 2020.
2. Jagan N.C, Control Systems, BS Publications, 2014.
3. Katsuhiko Ogata, Modern Control Engineering, Prentice Hall of India, 1998.

## MICRO PROCESSORS& MICRO CONTROLLERS

**III B.Tech I Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Acquire knowledge about Microprocessors, Microcontroller and its need.
2. Ability to identify basic architecture of different Microprocessors & Microcontroller
3. Develop systems for interfacing of different peripheral devices microprocessor & Microcontrollers
4. Compose a program to interface microprocessor and microcontroller for different applications.
5. Develop microcontroller application for different domain

**UNIT-I:**
**8086 Architecture:**
8086 Architecture-Functional diagram, Register Organization, Memory Banks, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, Minimum Modes – Maximum Modes, Timing diagrams.

**UNIT-II:**
**Instruction Set and Assembly Language Programming of 8086:**
Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, Simple Programs involving Logical, Branch and Call Instructions, sorting, Evaluating Arithmetic Expressions, String Manipulations.

**UNIT-III:**
**Interfacing RAM with 8086:**
8255PPI – Modes – Interfacing with 8086 – 8251 – Modes, Interfacing with 8086 – Interfacing Structure of 8086 – Interfacing with 8259 – 8257 DMA – Modes, Interfacing 8086 with – Stepper Motor Interfacing – 0800

**UNIT-IV:**
**Introduction to Microcontrollers:**
Overview of 8051 Microcontroller, Architecture, I/0 Ports, Memory Organization, Addressing Modes and instruction set of 8051

**UNIT-V:**
**8051 Real Time Control:**
Interrupts, Timers/Counters, and Serial Communication, Programming Timer Interrupts, Programming external Hardware Interrupts, Programming the Serial Communication interrupts, Programming 8051 Timers and Counters

**TEXT BOOKS:**
1. D. V. Hall, Microprocessors and Interfacing,Tata McGraw-Hill, 2006
2. Kenneth. J. Ayala, The 8051 Microcontroller ,Cengage Learning, 2005

**REFERENCE BOOKS:**


1. Ray A K and Bhurchandani K M, Advanced Microprocessors and Peripherals, Tata McGraw-Hill, 2006.
2. Uma Rao K., Andhe Pallavi , The 8051 Microcontrollers, Architecture and Programming and Applications, Pearson, 2009
3. Liu and GA Gibson, Micro Computer System 8086/8088 Family Architecture, Programming and Design, Prentice Hall of India, 1986.

## LINEAR & DIGITAL IC APPLICATIONS

**III B.Tech I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Demonstrate the functioning of OP-AMP, Special function and Digital ICs
2. Analyze the operation, characteristics of OP-AMP, Special Function and Digital ICs
3. Design a logic circuits using digital ICs
4. Devising filters, multivibrators, waveform generators & arithmetic circuits using OP-AMP and Special Function ICs.
5. Analyze and design applications like Counters FlipFlops Shift register using Digital integrated circuit.

**UNIT-I:**

**Operational Amplifier:**

Introduction, Advantages & Classification of IC's, IC chip size and circuit complexity, Ideal and Practical Op-Amp, Op-Amp Characteristics-DC and AC Characteristics and their compensations, Features of 741 Op-Amp

**Applications of Op-Amp:**

Inverting, Non-Inverting, Adder, Subtractor , Instrumentation, Sample and Hold Circuit, Differentiator and Integrator, Comparator & its applications, Schmitt Trigger, waveform Generators – Astable multivibrator, Monostable multivibrator,Triangular.

**UNIT-II:**

**Active filters:**

Introduction, Butterworth filters-1$^{st}$ order, 2$^{nd}$ order, LPF, HPF filters (VCVS), Characteristics of Band pass, Band rejects and All Pass Filters.

**D to A and A to D Converters:**

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

**UNIT-III:**

**Timer and Phase Locked Loops:**

IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications. IC565 PLL - Block Schematic, Description of Individual Blocks and Applications.

**Voltage regulator:** Introduction to Voltage Regulators, Features & Internal Operation of 723 Regulator, Design of low voltage and high voltage regulators using IC723 VR.

**UNIT-IV:**

**Digital Integrated Circuits:**

Parameters of logic families, Comparison of Various Logic Families, TTL Logic ,CMOS Logic TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs - Specifications and Applications of TTL-74XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD decoders with drivers , Encoder, Multiplexer, Demultiplexer, Parallel Binary Adder/ Subtractor, Magnitude Comparators.

**UNIT-V:**

**Sequential Logic IC's:**

74XX Series ICs - All Types of Flip-flops, Conversion between Flip-flops, Synchronous and Asynchronous Counters, Mod-N Counters, Shift Registers, Applications of Shift Registers

**TEXT BOOKS:**


1. Roy Choudhury D, Shail B. Jain, Linear Integrated Circuit,New Age International, 2012
2. Thomas L Floyd, Digital Fundamentals, Pearson Education, 2015.


**REFERENCE BOOKS:**


1. Ramakant A. Gayakwad, OP-AMP and Linear Integrated Circuits, Prentice Hall India, 2012.
2. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, McGraw Hill, 1997.
3. Gray, Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 1995.

## ANTENNA AND PROPAGATION

**III B.Tech I semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand different antennas, field analysis and their applications to antenna elements.
2. Distinguish the mechanism of radiation, different antenna characteristics, mathematical relations their estimates in practical cases.
3. Analyze and design the working of different antenna's and to interpret the radiation pattern of planar arrays from the knowledge of linear arrays.
4. Obtain the capability to differentiate and report the electromagnetic radiation levels in the Atmosphere and any radio transmissions.
5. Design Microwave antenna Systems from specification

**UNIT I:**

**Antenna Basics:**

Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height. Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem.

**Thin Linear Wire Antennas:**

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

**UNIT II:**

**Antenna Arrays:**

Point Sources – Definition, Patterns, and arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, and Uniform Linear Arrays – Broadside Arrays, End fire Arrays.

**Antenna Measurements:**

Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods).

**UNIT III:**

**VHF, UHF and Microwave Antennas - I:**

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns.

**VHF, UHF and Microwave Antennas – II:**

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

**UNIT IV:**

**Wave Propagation:**

Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts.

**Ground Wave Propagation:**
Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

**Space Wave Propagation:**
Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

**UNIT V:**
**Sky Wave Propagation:**
Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

**TEXT BOOKS:**

1. Kraus J D, Marhefka R J and Ahmad S. Khan, Antennas and Wave Propagation, Tata McGraw-Hill, 2010.
2. Jordan E C and Balmain K G, Electromagnetic Waves and Radiating Systems, Prentice Hall India, 2000.


**REFERENCE BOOKS:**

1. Balanis C A, Antenna Theory, John Wiley, 2005.
2. K.D. Prasad & Satya Prakashan, Antennas and Wave Propagation, Tech India Publications, 2001.
3. Keith Henney, Radio Engineering Handbook, Tata McGraw-Hill, 2012.

**COMPUTER ARCHITECTURE**
**(Professional Elective-1)**

**III B.Tech I Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Recall the structure and organization involved in computer design.
2. Identify the different memory and input- output system involved in system design.
3. Analyze computer parallelism and its design on program control and computer arithmetic operations.
4. Comprehend the various details of multiprocessor and multi-core processors in computer design.
5. Illustrate a better way the I/O and memory organization.

**UNIT-I:**
**Structure of Computers:**
Computer types, functional units, basic operational concepts, VonNeumann architecture, bus structures, software, performance, multiprocessors and multicomputer, data representation, fixed and floating point and error detecting codes.
**Register Transfer and Micro Operations:**
Register transfer language, register transfer, bus and memory transfers, arithmetic micro operations, shift micro operations, arithmetic logic shift unit

**UNIT-II:**
**Basic Computer Organization and Design:**
Instruction codes, computer registers, computer instructions, instruction cycle, timing and control, memory reference instructions, input, output and interrupt.
**Central Processing Unit:**
Stack organization, instruction formats, addressing modes, data transfer and manipulation, progra m control, reduced instruction set computer (RISC).

**UNIT-III:**
**Computer Arithmetic:**
Addition and subtraction, multiplication and division algorithms, floating point arithmetic operation, decimal arithmetic unit, and decimal arithmetic operations.

**UNIT-IV:**
**The Memory System:**
Basic concepts, semiconductor RAM types of read only memory (ROM), cache memory, performance considerations, virtual memory, secondary storage raid, direct memory access (DMA).
**Processor and Control Unit:**
Basic MIPS implementation – Building data path – Control Implementation scheme – Pipelining – Pipelined data path and control – Handling Data hazards & Control hazards – Exceptions.

**UNIT-V:**
**Parallelism:**
Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading, Multicore processors, Array Processors: Attached Array Processor- SIMO Array Processor.

**Multiprocessors:**
Characteristics of multiprocessors, interconnection structures, inter Processor arbitration, inter proce ssor communication and synchronization, and cache Coherence, shared memory multiprocessors.

**TEXT BOOKS:**

1. Moris Mano M , Computer System Architecture, Pearson, 2006
2. Carl Hamacher, Zvonko Vranesic, Computer Organization, McGraw Hill, 2002.


**REFERENCE BOOKS:**

1. William Stallings, Computer Organization and Architecture- Designing for performance, Prentice Hall, 2010.
2. Andrew S. Tanenbaum, Structured Computer Organization, Pearson, 2006.
3. Sivarama P. Dandamudi, Fundamentals of Computer Organization and Design, Springer, 2003.

**INFORMATION THEORY AND CODING**
**(Professional Elective-1)**

**III B.Tech I Semester**

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**COURSE OUTCOMES:**

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

1. Understand the concept of information theory, coding techniques and errors related to it.
2. Compare the different coding techniques.
3. Formulate codes using different coding techniques
4. Apply different coding techniques to develop an error free communication system.
5. Inspect error detection and correction in various coding technique.

**UNIT-I:**
**Basics of Information Theory:**
Entropy, Entropy for discrete ensembles, Information rate, source coding: Shannon's noiseless coding theorem, Shannon's noisy coding theorem, Mutual Information, Shannon- Hartley law

**UNIT-II:**
**Source Coding:**
Encoding of the Source Output, Shannon's Encoding Algorithm. Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm, Calculations of Channel capacity and bounds for Discrete Channel, Applications to continuous channels

**UNIT-III:**
**Information Channels:**
Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of : Binary Symmetric Channel, Binary Erasure Channel, Morgan's Theorem, Continuous Channels

**UNIT-IV:**
**Error Control Coding:**
Examples of Error control coding, methods of Controlling Errors, Types of Errors, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting hamming Codes, Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction

**UNIT-V:**
**Convolution Arithmetic Codes:**
Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm.

**TEXT BOOKS:**
1. Abramson N, Information and Coding, McGraw Hill, 1963.
2. Mansurpur M, Introduction to Information Theory, McGraw Hill, 1987.

**REFERENCE BOOKS:**
1. Ash R B, Information Theory, Prentice Hall, 1970.
2. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.
3. Chitode J S, Information Theory and coding, Technical publication, 2009.

**INTRODUCTION TO MEMS**
**(Professional Elective-1)**

**III B.Tech I Semester**

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**COURSE OUTCOMES:**

After this course students will be able to

1. Understand the basic concepts involved in the design of MEMS devices.
2. Interpret the different properties of MEMS materials
3. Enumerate role of MEMS devices on sensing and Actuation through different mediums.
4. Contrast the types of MEMS devices on different materials through different mediums.
5. Apply the MEMS for different applications.

**UNIT-I:**
**Introduction to MEMS and Micro-fabrication:**
History of MEMS Development, Characteristics of MEMS-miniaturization - microelectronics integration - Mass fabrication with precision. Micro fabrication - microelectronics fabrication process- silicon based MEMS processes- new material and fabrication processing- points of consideration for processing.

**UNIT-II:**
**Electrical and mechanical properties of MEMS materials:**
Conductivity of semiconductors, crystal plane and orientation, stress and stain – definition – relationship between tensile stress and stain- mechanical properties of silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- deflection of beam-longitudinal stain under pure bending spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

**UNIT-III:**
**Sensing and Actuation:**
Electrostatic sensing and actuation-parallel plate capacitor – Application-Inertial, pressure and tactile sensor parallel plate actuator- comb drive. Thermal sensing and Actuations-thermal sensors-Actuators- Applications- Inertial, Flow and Infrared sensors. Piezo resistive sensors- piezo resistive sensor material- stress in flexural cantilever and membrane Application-Inertial, pressure, flow and tactile sensor. Piezoelectric sensing and actuation- piezoelectric material properties-quartz-PZT-PVDF –ZnO Application-Inertial, Acoustic, tactile, flow-surface elastic waves Magnetic actuation- Micro magnetic actuation principle- deposition of magnetic materials-Design and fabrication of magnetic coil.

**UNIT-IV:**
**Bulk and Surface Micromachining;**
Anisotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), Isotropic wet etching, Basic surface micromachining process- structural and sacrificial material, stiction and antistiction methods, Foundry process.

**UNIT-V:**
**Polymer and Optical MEMS:**
Polymers in MEMS- polymide-SU-8 liquid crystal polymer (LCP) - PDMS-PMMA – Parylene – Flurocorbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS - passive MEMS optical components – lenses – mirrors - Actuation for active optical MEMS.

**TEXT BOOKS:**


1. Chang Liu,Foundations of MEMS, Pearson, 2006.
2. Gaberiel M Rebiz, RF MEMS Theory, Design and Technology, John Wiley & Sons, 2003.


**REFERENCE BOOKS:**


1. Charles P.Poole, Frank J.Owens, Introduction to nanotechnology, John Wiley, 2003.
2. Julian W.Gardner, Vijay K Varadhan, Microsensors, MEMS and Smart devices, John Wiley, 2001.
3. Nitaigour Premchand Mahalik, MEMS, Tata Mc graw-Hill, 2007.

**INTRODUCTION TO MICROCONTROLLERS**
**(Open Elective – 1)**

**III B.Tech I Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**
At the end of the course the student should be able to;

1. Interpret the internal organization of 8051 with its unique features.
2. Infer and give examples about the various addressing modes, instruction formats and instructions of 8051.
3. Construct the hardware and software interaction with each other using programming.
4. Summarize the features of the advanced architecture using ARM controller.
5. Train their practical knowledge through laboratory experiments.

**UNIT-I:**
**Overview Microcontroller:**
Microprocessors & microcontrollers- Comparison -Types – Selection criteria –Architecture – resources – Memory (RAM, ROM, DMA) - Watch dog timer, PWM– Buses- power down modes – EPROM – Interrupts- Serial communication

**UNIT-II:**
**8051 Family Microcontrollers:**
Architecture- 8051 microcontroller – Pins- Ports- Registers- Special function registers (SFR's) - Memory Organization- Counters and Timers.

**UNIT-III:**
**Programming the Microcontrollers:**
Addressing modes- Instruction Formats- Instruction set- Data transfer -Bit-manipulation – Arithmetic – Logical – Program flow control – Interrupt control flow – Simple Programs illustrating instruction set.

**UNIT-IV:**
**Systems Design and Interfacing Methods:**

Switch- Matrix Keypad – LED -7 Segment – LCD – Serial Interface – RS232- Parallel interface – IEEE1284 - IEEE 488 – ADC (0808) - DAC(0800) – Optical motor shaft encoders – Industrial control – Industrial process control system.

**UNIT-V:**
**ARM 32 Bit MCUs:**

Introduction to 16/32 Bit processors – ARM architecture and organization – ARM / Thumb programming model – ARM / Thumb instruction set – Development tools.

**TEXT BOOKS:**

1. Raj Kamal, Microcontrollers Architecture, Programming, Interfacing and System Design, Pearson, 2005.
2. Mazidi and Mazidi, the 8051 Microcontroller and Embedded Systems, Prentice Hall India, 2000.


**REFERENCE BOOKS:**

1. Ajay V Deshmukh, Microcontrollers: Theory & Applications, Tata McGraw Hill, 2005.
2. Jenneth J Ayala, 8051 Microcontrollers, Thomson Delmar Learning, 2005.
3. William Hohl, ARM Assembly Language fundamental and Techniques, CRC Press, 2009

**BASIC ELECTRONICS**
**(Open Elective – 1)**

**III B.Tech I Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Understand and analyze the different types of diodes, operation and its characteristics Design and analyze the DC bias circuitry of BJT and FET Design.
2. To analyze and design diode application circuits, amplifier circuits and oscillators employing BJT, FET devices.
3. Understand the different applications based on operational amplifier
4. Analyze different types of oscillators and multivibrators.
5. Design and analyze any digital logic gate circuits

**UNIT-I:**
**Semiconductor junction diodes and its applications:**
**Diode:**

Introduction to Semiconductor - PN junction Diode – Construction and operation – VI Characteristics of PN Junction diode-Diffusion and Transition Capacitances - Zener diode - Tunnel Diode

**Applications:**
Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Clippers and Clampers-Zener diode as voltage regulator.

**UNIT-II:**
**Semiconductor junction transistor:**
**Bipolar Junction Transistor (BJT):**
Construction and Operation of NPN and PNP transistors – CE, CB and CC configurations - Input and output characteristics of CE, CB and CC - Transistor biasing – Transistor as an Amplifier - Qualitative explanation of voltage gain, current gain, power gain, input impedance, output impedance, frequency response and bandwidth - Tuned amplifier Introduction to power amplifier

**UNIT-III:**

**Field effect transistor and operational amplifiers:**

**Field Effect Transistor (FET):**
Classification of FETs-JFET, MOSFET, operating principle of JFET. Drain and transfer characteristics of JFET (n-channel and p-channel), CS, CG, CD configurations.
**Operational Amplifiers (OP-Amp):**
Ideal OPAMP, Inverting and Non Inverting OPAMP circuits, OPAMP applications: voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable.

**UNIT-IV:**
**Electronic circuits:**
RC differentiator and integrators - Oscillators, RC Phase Shift Oscillator, Wien Bridge Oscillator, Hartley Oscillator and Colpitts Oscillator, Applications - Multivibrators, Types, Operation, Waveforms, Applications.

**UNIT-V:**

**Logic gates and its applications:**

**Logic Gates:**

Basic gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR - Building of AND, OR and NOT Gate with diodes.

**Applications:**

Half adder, Full adder, Half Subtractor, Full Subtractor and Binary parallel adder.

**TEXT BOOKS:**


1. Satyabrata Jit, Millman's Electronic Devices and Circuits, Tata McGraw Hill, 1998.
2. Millman, Digital and Switching Waveforms, Tata McGraw Hill, 2008.


**REFERENCE BOOKS:**


1. Boylestad R L and Louis Nashelsky, Electronic Devices and Circuits, Prentice Hall India, 2006.
2. Salivahanan S, Suresh Kumar N, Vallavaraj A, Electronic Devices and Circuits, Tata McGraw Hill, 2008
3. Morris Mano M, Charles R. Kime, Logic and Computer Design Fundamentals, Pearson, 2003.

## MICRO PROCESSORS AND MICRO CONTROLLERS LABORATORY

**III B.Tech I Semester**

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**COURSE OUTCOMES:**

After going through this course the student will be able to:

1. Apply the fundamentals of assembly level programming of microprocessors and microcontrollers.
2. Build a program on a microprocessor using instruction set of 8086 and 8051.
3. Evaluate Assembly language program for 8086 and 8051 microcontroller to interface peripheral devices for simple applications
4. Develop assembly language programs for various applications using 8051 microcontroller
5. Understand the development of prototype using combination of hardware and software.

**Note**: Minimum 12 Experiments have to be conducted

1. Introduction to MASM.
2. Programs for 16 bit Arithmetic Operations for 8086.
3. Program for sorting an array for 8086.
4. Program for searching a number or character in a string for 8086.
5. Programs for String Manipulations for 8086.
6. Interfacing to 8086 and programming to control Stepper Motor.
7. Interfacing ADC to 8086.
8. Interfacing DAC to 8086.
9. Serial Communication between Two Microprocessors using 8255.
10. Programming using Arithmetic, Logical and Bit Manipulation Instructions of 8051.
11. Program and verify timer/counter in 8051
12. Program and verify interrupt handling in 8051
13. UART operation in 8051
14. Interfacing LCD to 8051.
15. Data transfer from peripheral to memory through DMA Controller 8237/8257.

## LINEAR & DIGITAL IC APPLICATIONS LABORATORY

**III B.Tech I Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Study the applications of IC's such as 741,555 and 723
2. Design and construct the combinational and sequential circuits using digital IC's
3. Understand and design the adder and subtractor digital circuits.
4. Design and verify the Multiplexer
5. Understand the basics of Op-Amp and to Design, Analyze Adder subtractor and comparator

**Note**: Minimum 12 Experiments have to be conducted (six from each part)

**Part – A: Linear IC Applications:**

1. OP AMP Applications-Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC741
3. Active Filter Applications- LPF, HPF [Second Order ]
4. IC741 Waveform Generators-Square wave and Triangular waves.
5. Weighted/R-2R Ladder type DAC(Digital to analog converter)
6. IC 555 Timer AstableMultivibrator Circuit.
7. Calculation of Capture Range & Lock Range Using IC 565 PLL
8. Voltage Regulator using IC 723.

**Part – B: Digital IC Applications:**

1. Design of all logic gates using NAND/NOR gates and verify the truth tables.
2. Design full adder & full subtractor using NAND/NOR gates and verify the truth table.
3. Design T & D flip flops using JK flip flop and verify the truth table.
4. Design any 4 variable functions using 8:1 Multiplexer and verify.
5. Verification of 4-bit Magnitude comparator
6. Design full adder using 3*8 Decoder and verify.
7. Verification of 4-bit Decade counter
8. Verification of Universal Shift Register

## PERSONALITY DEVELOPMENT AND BEHAVIOURAL SKILLS

**III Year I semester**

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**Course Outcomes:**

1. Practice optimistic attitude for an efficient, socially viable and multi-faceted personality.
2. Demonstrate functions of non-verbal c*ommunication in formal context*.
3. Build effective individual & team dynamics for professional accomplishments.
4. Analyze appropriate strategic Interpersonal Skills for productive workplace relationships.
5. Correspond in multiple contexts, for varied audiences, across genres and modalities.

**UNIT – I:**
**Personality Development:**
Definition - Various Aspects of Personality Development - Behavioural Traits. Importance of Soft Skills for personal and professional development - Success stories.

**UNIT – II:**
**Non Verbal Communication:**
Kinesics, Haptics, Proxemics, Vocalics, Oculesics Body Language informal contexts such as Group Discussions, Presentations and Interviews.

**UNIT – III:**
**Team Dynamics:**
Different Types of Teams– Role of an individual – Communicating as a group or team leader Individual Presentations/Team Presentation-Project Presentations- Case Studies

**UNIT-IV:**
**Interpersonal Skills:**
Time Management- Stress Management- Emotional Intelligence- Conflict Management- Relationship Management

**UNIT-V:**
**Digital Correspondence:**
Role of Multimedia in Communication - Communication in a Digital Edge (Video Conference Etc.) Social Networking: Importance and Effects.

**Textbooks:**

1. Personality Development and Soft Skills, Shikha Kapoor, Preparing for Tomorrow, Wiley, 2020.

**Reference Books:**

1. Personality Development and Soft Skills, Barun K Mitra, Oxford University Press, 2016.
2. Professional Ethics, Subramanian R, Oxford University Press, 2015.

## MANAGERIAL ECONOMICS & AND FINANCIAL ANALYSIS

**III B.Tech II semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the importance of certain basic issues governing the business operations namely demand and supply, production function, cost analysis.
2. Apply managerial tools and techniques in obtaining optimal solutions for business problems.
3. Differentiate the various forms of business organizations.
4. Evaluate and interpret the financial statements of companies using ratios.
5. Apply the methods of capital budgeting in effective investment decision making.

**UNIT – I:**
**Introduction to Managerial Economics& Demand Analysis:**

Definition, Nature and Scope of Managerial Economics.Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

**UNIT – II:**
**Production & Cost Analysis:**

Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts (Opportunity cost vs outlay costs, Fixed, variable and semi variable costs, marginal cost vs average cost, out of pocket vs book cost, imputed cost, implicit & explicit cost, incremental and decremental cost, sunk vs future cost, separable and joint costs) Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

**UNIT – III:**
**Markets & New Economic Environment:**

Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing: Objectives and Policies of Pricing. Methods of Pricing. Business: Features and evaluation of different forms of Business Organization: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, New Economic Environment: Changing Business Environment in Post-liberalization scenario.

**UNIT – IV:**
**Introduction to Financial Accounting & Financial Analysis:**

Accounting concepts and Conventions - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).Financial Analysis: Analysis and Interpretation of Liquidity Ratios (current ratio, quick ratio), Activity Ratios(inventory turnover ratio, debtors turnover ratio), and Capital structure Ratios( debt equity ratio, interest coverage ratio) and Profitability ratios( gross profit ratio, net profit ratio, operating profit ratio, P/E ratio, EPS). Du Pont Chart.

**UNIT – V:**
**Capital Budgeting:**

Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital, Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return

(ARR), Net Present Value Method (simple problems), IRR and PI method.

**TEXT BOOKS:**


1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
2. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.


**REFERENCE BOOKS:**


1. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
2. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
3. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
4. Dwivedi: Managerial Economics, Vikas, 2012.
5. Kasi Reddy, Saraswathi, MEFA, PHI Learning, 2012.

## DIGITAL SIGNAL PROCESSING

**III B.Tech II Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Define the concepts of Fourier transforms, digital filters with their effect of errors.
2. Illustrate speed and memory requirements of Fourier transforms on signals.
3. Relate the effects of finite word length on systems.
4. Formulate frequency filtering, impulse response filters with its structure.
5. Ability to understand various applications of DSP such as multi rate signal processing, telecommunication.

**UNIT-I:**
Introduction to DSP- applications-advantages
**Discrete Fourier Transform:**
DTFT, DFT-Complexity calculation- Properties of DFT- linear convolution- Circular convolution- Sectioned convolution- Relation between DTFT, DFS, DFT and Z-Transform.

**UNIT-II:**
**Fast Fourier Transform:**
Fast Fourier Transform (FFT), Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT- Convolution of sequences using FFT.

**UNIT-III:**
**IIR Digital Filters:**
Analog filter approximations –Butterworth and Chebyshev- Design of IIR digital filters from analog filters- Impulse invariant technique – warping effect- bilinear transformation method - Spectral transformations, realization of IIR filters- direct, canonic, cascade and parallel forms.

**UNIT-IV:**
**FIR Digital Filters:**
Characteristics of FIR Digital filters - frequency response – Gibbs Phenomenon- Design of FIR filters - window techniques – Frequency Sampling - Comparison of IIR and FIR filters, realization of FIR filters- direct& cascade forms

**UNIT-V:**
**Finite Word Length Effects:**
Quantization- Quantization error- Types- Limit cycles- Overflow oscillations –Scaling
**Multirate Signal Processing:** Introduction - down sampling- Decimation – up sampling – Interpolation -Sampling Rate Conversion

**TEXT BOOK:**

1. John G. Proakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson, 2007.
2. Tarun Kumar Rawat , Digital Signal Processing, Oxford Publications, 2015

**REFERENCES BOOKS:**


1. Andreas Antoniou, Digital Signal Processing, TATA McGraw Hill , 2006
2. Ashok Ambardar, Digital Signal Processing, Cenage Learning, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Cenage Learning, 2011.

## MICROWAVE ENGINEERING

**III B.Tech II Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understands the application of 3-D coordinate geometry, calculus and vector geometry to analyze the EM wave transmission at microwave frequencies.
2. Analyze the problem within the Microwave Transmission line by considering the parameters at transmitter and receiver.
3. Design the microwave components and different transmission lines with the given characteristics at microwave frequencies.
4. Apply the knowledge of microwave components and devices in RADAR communication and satellite communication.
5. Able to discriminate different Radars, find applications and use of its supporting systems.

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

**UNIT II:**
**Helix TWTs and M-Type Tubes:**
**Helix TWTs:**
Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

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

**UNIT III:**
**Microwave Solid State Devices:**
Introduction, Classification, Applications. TEDs Introduction, Gunn Diodes Principle, RWH Theory, Characteristics, Modes of Operation Gunn Oscillation Modes, Principle of operation of IMPATT and TRAPATT Devices.

**UNIT IV:**
**Waveguide Components:**
Coupling Mechanisms Probe, Loop, Aperture types. Waveguide Discontinuities Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions E plane and H plane Tees. Ferrites Composition and Characteristics, Faraday rotation, Ferrite Components Gyrator, Isolator.

**UNIT V:**

**Scattering matrix and Microwave Measurements:**

**Scattering matrix:**

Scattering Matrix Properties, Directional Couplers 2 Hole, Bethe Hole, [s] matrix of Magic Tee and Circulator.

**Microwave Measurements:**

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

**TEXT BOOK:**


1. Samuel Y. Liao, Microwave Devices and Circuits, Pearson, 2003.
2. Herbert J. Reich, J. G. Skalnik, P. F. Ordung and H. L. Krauss , Microwave Principles CBS Publishers, 2004.


**REFERENCES BOOKS:**


1. David M. Pozar, Microwave Engineering, John Wiley, 2011.
2. Raghuvanshi G S, Microwave Engineering, Cengage Learning, 2012.
3. Peter A. Rizzi, Microwave Engineering Passive Circuits, Prentice Hall India, 1999.

## DATA COMMUNICATION AND NETWORKS

**III B.Tech II Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Demonstrate concepts of various types of computer networks, TCP/IP and OSI models.
2. Analyze different LLC multiplexing mechanisms, node-to-node flow and error control
3. Analyze different MAC mechanisms (Aloha, Slotted Aloha, TDMA, FDMA) and understand their pros and cons.
4. Identify and design the different types of network devices and shortest path in a given network & Enable to interconnect various heterogeneous networks.
5. Implement a peer to peer file sharing application utilizing application layer protocols and transportation layer protocol.

**UNIT – I:**

**Introduction to Networks:**

Internet, Protocols and Standards, the OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.

**Physical Layer:**

Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

**UNIT – II:**

**Data Link Layer:**

Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

**UNIT – III:**

**Network Layer:**

Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman& Ford, Disjkstra's routing protocols, RIP, OSPF, BGP,- and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

**UNIT – IV:**

**Transport Layer:**

Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service

**Application Layer:**

Domain Name Space, DNS in Internet, Electronic Mail, File Transfer Protocol, WWW, HTTP, SNMP, Multi-Media.

**UNIT – V:**

**Network Security:**

Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall, IPv4, IPv6.

**TEXT BOOKS:**


1. James F. Kurose, K. W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson, 2013.
2. Behrouz A. Forouzan, Data Communications and Networking, Mc Graw Hill, 2006.

**REFERENCE BOOKS:**


1. William Stallings, Data communications and Networks, Pearson, 2007.
2. Bhusan Trivedi, Data communication and Networks, Oxford university press, 2016.
3. Keshav S, an Engineering Approach to Computer Networks, Pearson, 1997.

**DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES**
**(Professional Elective-2)**

**III B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand signal processing principles, interfacing strategies and the different architectural features of DSP processors.
2. Differentiate the architectural features of various DSP processors.
3. Illustrate the methodology of writing programs for TMS32OC54xx.
4. Explain the system development using DSP Processors for various applications.
5. Able to introduce architectural features of analog devices family of DSP devices i.e. ADSP 2100, ADSP 2181 and blackfin processor

**UNIT –I:**

**Introduction to Digital Signal Processing:**

Digital signal processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), LTI systems, Digital filters, Decimation and interpolation.

**Computational Accuracy in DSP Implementations:**

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

**UNIT —II:**

**Architecture for Programmable DSP Devices:**

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

**UNIT –III:**

**Programmable Digital Signal Processors:**

Commercial Digital signal- processing Devices, Data Addressing modes of TMS32OC54XX DSPs, TMS32OC54XX Processors- Data Addressing modes, Memory space, Program Control, instructions and Programming, On-Chip Peripherals, Interrupts, Pipeline Operation.

**UNIT –IV:**

**Analog Devices Family of DSP Devices:**

Analog Devices Family of DSP Devices —ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

**Introduction to Blackfin Processor:**

The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

**UNIT –V:**

**Interfacing Memory and I/O Peripherals to Programmable DSP Devices:**

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

**TEXT BOOKS:**


1. Avatar Singh & S. Srinivasan, Digital Signal Processing, Thomson Publications, 2004.
2. Padmanabhan K, Vijayarajeswaran R, Ananthi S, A Practical Approach To Digital Signal Processing, New Age International, 2009.


**REFERENCE BOOKS:**


1. Venkataramani B and Bhaskar M, Digital Signal Processors, Architecture, Programming and Applications, Tata, Mc Graw Hill, 2002.
2. Jonatham Stein, Digital Signal Processing, John Wiley, 2005.
3. Phil Lapsley, Jeff Bier, Amit Shoham, Lee Ea, Edward A. Lee, DSP Processor Fundamentals, Architectures & Features, Wiley, 1997.

**MODELING AND SIMULATION USING MATLAB**
**(Professional Elective-2)**

**III B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Develop codes on various domains of Electronics and Communication Engineering
2. Handle the advanced commands in appropriate fields of engineering
3. Visualize the impact of parameters during simulation
4. Cater the industrial needs pertaining to the semiconductor technologies.
5. Students will be able to implement simulation models using the tool Simulink.

**UNIT-I:**
**Introduction to MATLAB:**
Components of MATLAB desktop-Types of files- Variables and Arrays Handling Arrays Operators and Special Characters- Input/ Output commands File handling-Data types Functions Built-in and user defined functions passing arguments Cell arrays &Structures Strings 2D strings-String comparing - Concatenation.

**UNIT- II:**
**Programming:**
Introduction - Control Flow Conditional Control if, else, switch -Loop Control for, while, continue, break , Program Termination return- TRY & CATCH - Error trapping - Writing programs with logic and flow control - Differentiation & Integration using MATLAB-, Debugging methods -

**UNIT-III:**
**Plotting in MATLAB & GUI:**
Introduction-The plot command-Formatting Plot-Multiple Plots-Adding legend to the plot-Subplot-Plotting complex data-Basic 2D plots, Labels, Line style, Markers, Grid axis- Log, Log-Log, Semilog-Polar, fplot, ezplot, ezpolar, Hold, Stem, Bar, Hist, Interactive plotting - 3D plots – Mesh - Contour - Example programs- Fundamentals of GUI Creation

**UNIT-IV:**
**Application Programs:**
Diode Characteristics-BJT characteristics-Half wave and Full wave Rectifier-Open Loop gain of OPAMP-Signal generation-Frequency response of FIR & IIR filters

**UNIT-V:**
**Simulink & applications:**
Introduction-Getting Simulink-Creating and Simulating a Simulink model-Creating a subsystem in Simulink- Data import and export-Simulink solution of Differential equations- Using Simulink generating an AM, PCM, DPCM-Designing of FWR & HWR using Simulink.

**TEXT BOOKS:**


1. RudraPratap, Getting Started with MATLAB 6.0, Oxford University Press, 2004.
2. **Sanjeevan Kapshe, Shailendra Jain**, Modeling and Simulation Using Matlab – Simulink, Wiley, 2016.


**REFERENCE BOOKS:**


1. William J.Palm, Introduction to MATLAB 6.0 for Engineers, McGraw Hill, 2001
2. Herniter M, Programming in MATLAB, Thomson Learning, 2001
3. John Okyere Attia, John O. Attia, Electronics and circuit analysis using MATLAB, CRC press, 1999.

**OPTICAL COMMUNICATIONS**
**(Professional Elective-2)**

**III B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Gain Knowledge in optical communication, components, Mode theory, sources & detectors and Losses in optical fibers.
2. Analyze single & multimode fibers and analog & digital links.
3. Design and develop Optical sources, Detectors and links
4. Develop Multi-Channel Optical Systems
5. Discuss the elements of WDM networks and its potential applications.

**UNIT-I:**
**Introduction to optical fiber waveguides:**
Introduction, vector nature of light: linear polarization-elliptical polarization and circular polarization - the quantum nature of the light, optical fiber modes and configurations: fiber types-rays and modes- step index fiber structure-ray optic representation - wave representation

**UNIT-II:**
**Optical fibers and fiber losses:**
**Optical Fibers:**
Types of optical fibers: Step-Index Fibers - Graded-Index Fibers, Fiber Modes: Single-Mode Fiber, Dispersion in Single-Mode Fibers - Group-Velocity Dispersion - Material Dispersion - Waveguide Dispersion - Higher-Order Dispersion - Polarization-Mode Dispersion.
**Fiber Losses:**
Attenuation, absorption, scattering losses, bending losses, core and cladding losses.

**UNIT III:**
**Optical sources and detectors:**
**Optical Sources:**
Light Emitting Diodes: Structures - Light Source Materials - Quantum Efficiency and LED Power - Modulation of LED, Laser Diodes: Laser Diode Modes and Threshold Conditions - Laser Diode Rate Equations - External Quantum Efficiencies - Resonant Frequencies.
**Optical Detectors:**
Physical Principles of Photo Diodes, Photo Detector Noise, Detector Response Time, Avalanche Multiplication Noise, Structures for InGaAs& APDs, Temperature Effect on Avalanche Gain, Comparisons of Photo Detectors.

**UNIT-IV:**
**Optical links:**
Fundamental receiver operation: Digital signal transmission Error Sources Receiver Configuration, Digital Links: Point-to-Point Links: System consideration Link power budget Rise time budget Line coding: NRZ Codes RZ Codes Block Codes, Noise effect on system Performance: Modal Noise Mode-Partition Noise Chirping Refection Noise, Analog Links: Overview, Carrier to Noise Ratio: Carrier Noise Photo detector nose & Preamplifier noise Relative Intensity Noise (RIN) Reflection Effects on RIN, Multi-channel Transmission Techniques: Multichannel Amplitude Modulation Multichannel Frequency Modulation Subcarrier Multiplexing.

**UNIT-V:**

**Optical amplifiers and multichannel systems:**

**Optical Amplifiers:**

Basic Concepts: Gain Spectrum and-Gain Saturation-Amplifier Noise Amplifier Applications, Raman Amplifiers: Raman Gain and Bandwidth - Amplifier Characteristics - Amplifier Performance, Erbium-Doped Fiber Amplifiers: Pumping Requirements - Gain Spectrum - Simple Theory - Amplifier Noise - Multichannel Amplification - Distributed-Gain Amplifiers.

**Multichannel Systems:**

WDM Light wave Systems: High-Capacity Point-to-Point Links - Wide-Area and Metro-Area Networks - Multiple-Access WDM Networks, WDM Components: Tunable Optical Filters - Multiplexers and Demultiplexers - Add–Drop Multiplexers - Star Couplers - Wavelength - Optical Cross - Wavelength Converters - WDM Transmitters and Receivers

**TEXT BOOKS:**


1. Keiser J, Fibre Optic communication, McGraw-Hill, 2013.
2. Tamir T, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.


**REFERENCE BOOKS:**


1. Max Ming-Kang Liu, Principles and Applications of Optical Communications, Tata McGraw Hill, 2010.
2. Gupta S C, Optical Fiber Communication and its Applications, Prentice Hall India, 2005.
3. Allard F C, Fiber Optics Handbook for engineers and scientists, McGraw Hill, 1990.

**BASIC ELECTRONIC INSTRUMENTATION**
**(Open Elective – 2)**

**III B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

After successful completion of this course, the students should be able to

1. Comprehend the basics of instrumentation system and its static and dynamic characteristics.
2. Classify and describe resistive, inductive, capacitive and other transducers which are used for measuring various parameters.
3. Understand the working principles of oscilloscopes, signal generators and analyzers.
4. Explain about different types of signal analyzers
5. Apply the complete knowledge of various electronics instruments/transducers to measure the physical quantities in the field of science, engineering and technology

**UNIT I:**
**Basics of Instrumentation and Its Characteristics:**
Functional Elements of Measurement Systems - Classification of errors, Limiting error and probable error –Error analysis –Static characteristics– accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effect etc– generalized mathematical model of measurement systems – dynamic characteristics.

**UNIT II:**
**Electronic Instruments and Bridges:**
Electronic Instruments for Measuring Basic Parameters: DC Volt meter, AC Voltmeter, DC Ammeter, Ohm meter, Electronic multi-meter, Digital voltmeter.
Bridge Measurement: DC bridges- Wheatstone, Kelvin Bridge, AC bridges –Hay, Maxwell, Schering and Wien bridges.

**UNIT III:**
**Oscilloscopes:**
**Oscilloscopes:**
Block diagram of CRO, Cathode Ray Tube, Vertical and Horizontal Deflection Systems, Delay lines, Probes, Specification of an Oscilloscope. Oscilloscope measurement Techniques, Special Oscilloscopes – Storage Oscilloscope, Sampling Oscilloscope.

**UNIT IV:**
**Signal Generators and Analyzers:**
Signal Generators: Sine wave generator, Frequency – Synthesized Signal Generator, Sweep frequency Generator. Pulse and square wave generators. Function Generators.
Signal Analysis: Wave Analyzer, Spectrum Analyzer. Frequency Counters: Simple Frequency Counter; Distortion Analyzer.

**UNIT V:**
**Transducers:**
Transducers: Definition-classification-characteristics-Selection Principle of operation, construction, characteristics and application of semiconductor strain gauge, LVDT, Capacitive transducer-Digital transducers- Introduction to Smart sensors and MEMS.

**TEXT BOOKS:**


1. Albert D Helstrick and William D Cooper, Modern Electronics Instrumentation & Measurement Techniques, Pearson, 2011.
2. Carr, Elements of Electronics Instrumentation and Measurement, Pearson, 1996.


**REFERENCE BOOKS:**


1. Doebelin E A, Measurement Systems – Applications and Design, Tata Mc Graw Hill, 2012
2. John P. Bentley, Principles of Measurement Systems, Pearson Education, 2005.
3. Ranganathan S, Transducer Engineering", Allied Publishers, 2003.

**CONSUMER ELECTRONICS**
**(Open Elective – 2)**

**III B.Tech II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand electronics engineering concepts used in consumer electronics systems.
2. Identify the need of preventive maintenance in various electronic appliances.
3. Evaluate and analyze different electronic products and systems based on specifications.
4. Use different product safety, compliance standards and techniques associated with electronic products.
5. Identify the need of preventive maintenance in various electronic appliances.

**UNIT –I:**

**Audio systems:**

Audio System : Microphones, loudspeakers baffle and enclosure, Acoustics, mono, stereo, Quad, Amplifying System, Equalizers and Mixers Synthesizers, Commercial Sound, Theater Sound System.

**UNIT -II:**

**Video Systems:**

Video Systems and Displays: Monochrome, Color TV standards, TFT, Plasma, HDTV, LCD, LED TV, Direct-To-Home (DTH- Set Top Box), Video Telephone and Video Conferencing

**UNIT – III:**

**Domestic & Consumer Appliances I:**

Washing machines, Microwave Oven,Air-conditioners and Refrigerators, Computers office System, Telephone & Mobile Radio System

**UNIT-IV:**

**Domestic & Consumer Appliances II:**

Power Supplies SMPS/UPS and Preventive Maintenance and others systems such as Remote controls, Bar codes, RFID Product

**UNIT – V:**

**Safety & Liability Issues:**

Product Compliance: Product safety and liability issues; standards related to electrical safety and fire hazards, EMI/EMC requirements, design techniques for ESD, RF interference and immunity, line current harmonics and mains voltage surge.

**TEXT BOOKS:**


1. Bali S P, Consumer Electronics, Pearson, 2007
2. Chitode J S, Consumer Electronics: A Conceptual Approach, Technical Publications, 2007.


**REFERENCE BOOKS:**


1. Philip Hoff, Philip Herbert Hoff, Consumer Electronics for Engineers , Cambridge University Press,1998
2. Douglas Kinney, A Beginners Guide to Consumer Electronics Repair: Hand Book and Tutorial, iUniverse, 2006
3. Sridhar Canumalla, Puligandla Viswanadham, Portable Consumer Electronics Packaging, Materials, and Reliability, PennWell, 2010.

## DIGITAL SIGNAL PROCESSING LABORATORY

**III B.Tech II semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Formulate programs for performing time & frequency operation on signals and systems.
2. Design and implement impulse response filters and Multirate system for a given sequence
3. Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters
4. Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques
5. Develop various DSP Algorithms using MATLAB Software package.

**Note**: Minimum 12 Experiments have to be conducted

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

## ADVANCED COMMUNICATION SKILLS LAB

**III Year II semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes:**

1. Develop sound communication skills in various situations with the help of enriched vocabulary.
2. Practice reading techniques for a faster and better comprehension.
3. Exhibit strong writing skills to express ideas effectively.
4. Demonstrate effective presentation skills.
5. Use appropriate verbal and non-verbal skills for a successful career.

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

**UNIT-II:**
**Activities on Reading Comprehension:**
General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

**UNIT-III:**
**Activities on Writing Skills:**
Structure and presentation of different types of writing – letter writing/ Resume writing/ Statement of purpose - E-correspondence/ Technical report writing / Portfolio writing – planning for writing – improving one's writing.

**UNIT-IV:**
**Activities on Presentation Skills:**
Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e-mails/assignments etc.

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

**Reference Books:**


1. Technical Communication by Meenakshi Raman &Sangeeta Sharma, Oxford University, 2nd Edition, 2011.
2. Functional English for Success, Orient Longman, 2014.

**QUANTITATIVE METHODS & LOGICAL REASONING**
**(From Training and Placement Dept.)**

**III B.Tech II semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 1 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. To perform well in various competitive exams and placement drives.
2. To solve basic and complex mathematical problems in short time.
3. To become strong in Quantitative Aptitude and Reasoning which can be applied for GRE, GATE, GMAT or CAT exam also.
4. To develop problem solving skills and analytical abilities, which play a great role in corporate and industry set up.

**UNIT – I:**
**Number System:**
Speed Maths, Numbers, Factors, Prime & Co Primes, LCM & HCF, Divisibility Rules, Finding Unit Place Digit and Last Two Digits of an Expression

**Ratio, Proportion and Variations:**
Definition of Ratio, Ratio of Proportion, Comparison of Ratios, Compound ratio, Direct and Indirect Proportion

**Percentages:**
Converting Fractions and Decimal into Percentages, Successive Percentage, Populations, Expenditure and Savings

**Profit and loss:**
Relation between Cost Price and Selling Price, Discount and Marked Price, Gain or Loss Percentages on Selling Price

**Simple and Compound Interest:**
Problems on Interest (**I**), Amount (**A**), Principal (**P**) and Rate of Interest (**R**) difference between the Simple Interest and Compound Interest for 2 and 3 years.

**UNIT – II:**
**Partnership:**
Relation between Partners, Period of Investment and Shares

**Averages, Ages and Allegation:**
Average of Different Groups, Change in Averages by Adding, Deleting and Replacement of Objects, Problems on ages, Allegation Rule, Mean Value of the Mixture, Replacement of Equal Amount of Quantity.

**Time and Work:**
Men and Days, Work and Wages, Pipes and Cisterns, Hours and Work, Alternate Days Concept,

**Time and Distance:**
Difference between the Average and Relative Speeds, Reaching the Destination Late and Early, Stoppage Time Per Hour, Time and Distance between Two Moving Bodies : Train Crossing Man - same and opposite directions, Speed of Boat and Stream,

**UNIT – III:**

**Progressions and Quadratic Equations:**

Arithmetic, Geometric and Harmonic Progressions, Arithmetic Mean, Geometric Mean and Harmonic Mean and their Relations. General form of Quadratic Equation, Finding the Roots of Quadratic Equation, Nature of the Roots.

**Permutation and Combination:**

Fundamental Rules, Problems on Permutations & combinations.

**Probability:**

Definition of probability, Notations and Formulae, Problems on Probability.

**Data Interpretation and Data Sufficiency:** Tabular and Pie-charts, Bar and Line Graphs, Introduction to Data Sufficiency, Problems on Data Sufficiency.

**UNIT – IV:**

**Deductions:**

Statements and conclusions using Venn diagram and Syllogism Method

**Series completion:**

Number series, Alphabet series, Letter Series.

**Coding and Decoding:**

Letter coding, Number coding, Number to letter coding, Matrix Coding, Substitution, Mixed Letter Coding, Mixed Number Coding, Deciphering Individual Letter Codes by Analysis.

**Analytical Reasoning Puzzles:**

Problems on Linear, Double line-up and Circular Aarrangements, Selections and Comparisons.

**Blood Relations:**

Defining the various Relations among the Members of a Family, Solving Blood Relation Puzzles by using Symbols and Notations. Problems on Coded Relations.

**UNIT – V:**

**Direction sense Test:**

Sort of directions in puzzles distance between two points, problems on shadows, Application of triangular triplets.

**Clocks:**

Relation between Minute-Hour Hands, Angle vs Time, Exceptional Cases in Clocks

**Calendars:**

Definition of a Leap Year, Finding the Odd days, Finding the Day of any Random Calendar Date, repetition of Calendar Years.

**Cubes and Dices:**

Finding the Minimum and Maximum Number of Identical Pieces and Cuts, Painting of Cubes and cuts, Problems on Dice.

**Venn Diagrams:**

Circular Representation of given words, Geometrical Representation of Certain class, Set theory based Problems.

**TEXT BOOKS**:


1. Philip Geer, Verbal Reasoning, Barrons Educational Series, 2019
2. Agarwal R S, A Modern Approach to Logical Reasoning & Quantitative Aptitude, S. Chand, 2019.


**REFERENCE BOOKS:**


1. R. V. Praveen, Quantitative Aptitude, Prentice Hall India, 2016
2. Abhijit Guha , Quantitative Aptitude, Mc Graw Hill, 2019
3. Mohan Rao U, Quantitative Aptitude, SCITECH, 2012.

## COURSE STRUCTURE FOR B.TECH IV YEAR

**IV B.Tech I Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PC – 14 | Embedded System Design | 2 | 1 | 0 | 3.0 |
| 2 | PC – 15 | VLSI Design | 2 | 1 | 0 | 3.0 |
| 3 | PE-3 | **Professional Elective-3**<br>1. Digital Image Processing<br>2. Cellular and Mobile Communications<br>3. Radar Engineering | 3 | 0 | 0 | 3.0 |
| 4 | PE-4 | **Professional Elective-4**<br>1. Biomedical Instrumentation<br>2. Satellite Communications<br>3. Telecommunication Switching Systems and Networks | 3 | 0 | 0 | 3.0 |
| 5 | OE-3 | **Open Elective-3**<br>1. Automotive Electronics<br>2. Introduction to Communication Engineering | 3 | 0 | 0 | 3.0 |
| 6 | PC Lab-8 | Embedded & VLSI Laboratory | 0 | 0 | 2 | 1.0 |
| 7 | PC Lab-9 | Antenna and Microwave Engineering Laboratory | 0 | 0 | 2 | 1.0 |
| 8 | Mini P | Mini Project | 0 | 0 | 0 | 3.0 |
| | | **Total** | **13** | **2** | **4** | **20** |

**IV B.Tech II Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PC-16 | Electronic Measurements & Instrumentation | 3 | 0 | 0 | 3.0 |
| 2 | PC-17 | Wireless Communications and Networks | 3 | 0 | 0 | 3.0 |
| 3 | TS | Technical Seminar | 0 | 0 | 0 | 2.0 |
| 4 | CVV | Comprehensive Viva Voce | 0 | 0 | 0 | 2.0 |
| 5 | MP | Major Project | 0 | 0 | 0 | 10.0 |
| | | **Total** | **6** | 0 | 0 | **20** |

## COURSE STRUCTURE FOR B.TECH IV YEAR (FAST TRACK)

**IV B.Tech I Semester:**

| S.No. | Course Category | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PC – 14 | Embedded System Design | 2 | 1 | 0 | 3.0 |
| 2 | PC – 15 | VLSI Design | 2 | 1 | 0 | 3.0 |
| 3 | PE-3 | **Professional Elective-3**<br>1. Digital Image Processing<br>2. Cellular and Mobile Communications<br>3. Radar Engineering | 3 | 0 | 0 | 3.0 |
| 4 | PE-4 | **Professional Elective-4**<br>1. Biomedical Instrumentation<br>2. Satellite Communications<br>3. Telecommunication Switching Systems and Networks | 3 | 0 | 0 | 3.0 |
| | **PC-17** | **Fast Track** | | 0 | 0 | |
| 5 | OE-3 | **Open Elective-3**<br>1. Automotive Electronics<br>2. Introduction to Communication Engineering | 3 | 0 | 0 | 3.0 |
| 6 | PC Lab-8 | Embedded & VLSI Laboratory | 0 | 0 | 2 | 1.0 |
| 7 | PC Lab-9 | Antenna and Microwave Engineering Laboratory | 0 | 0 | 2 | 1.0 |
| 8 | - | Mini Project | 0 | 0 | 0 | 3.0 |
| | | **Total** | **13** | **2** | **4** | **20** |

## EMBEDDED SYSTEM DESIGN

**IV B.Tech I-Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Outcomes:**

At the end of the course the student should be able to

1. Expected to understand the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. Expected to visualize the role of Real time Operating Systems in Embedded Systems
4. Expected to evaluate the Correlation between task synchronization and latency issues
5. To enumerate the need for Task Communications in a Multiprocessor Environment.

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

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

**UNIT III:**
**Embedded Firmware:**
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**UNIT IV:**
**RTOS Based Embedded System Design:**
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

**UNIT V:**
**Task Communication:**
Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

**TEXT BOOKS:**


1. Shibu K V, Introduction to Embedded Systems, McGraw-Hill Education, 2009.
2. Raj Kamal, Embedded Systems: Architecture, Programming and Design, Tata McGraw-Hill, 2011.

**REFERENCE BOOKS:**


1. Raj Kamal , Embedded systems architecture, programming and design, McGraw-Hill Education, 2003
2. Frank Vahid, Tony Givargis , Embedded System Design A Unified Hardware/Software Introduction, John Wiley, 2003
3. Lyla B. Das, Embedded Systems: An Integrated Approach, Pearson, 2012.

**VLSI DEISGN**

**IV B.Tech I-Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Enumerate different steps involved in Integrated Circuits technology for MOS transistor and explain the primary and secondary effects of MOSFET and BICMOS.
2. Summarize the fabrication process involved in VLSI circuits
3. Outline the design process involved in VLSI design flow for design of MOS transistors.
4. Understand and apply the concepts of memories in design.
5. Design digital circuits using Verilog HDL.

**UNIT-I:**
**Introduction:**
Introduction to IC Technology MOSFET CMOS - BiCMOS
**Basic Electrical Properties:**
Electrical PropertiesMOS- primary characteristics - threshold Voltage – Secondary characteristics- Ratioed Circuits- CMOS, BiCMOS Inverter – analysis- design.

**UNIT-II:**
**VLSI Circuit Design Processes:**
VLSI Design Flow - MOS Layers - Stick Diagrams - Design rules - wires – Contacts – Transistors- Layout Diagrams – NMOS – PMOS - CMOS Inverters – Gates - Scaling of MOS circuits.

**UNIT-III:**
**Gate Level Design:**
Logic Gates – Pass transistors, Transmission gate- Switch logic - Alternate gate circuits, Latches- Time delays - Driving large capacitive loads - Wiring capacitance, Fan — in, Fan — out, Choice of layers.
**Programmable Logic Devices:**
ROM – PLA - PAL-Design Approach - CPLDs – FPGA -Parameters influencing low power design.

**UNIT-IV:**
**Introduction to Verilog HDL:**
Overview of Digital Design with Verilog HDL, typical HDL-flow, Concurrency, Simulation and Synthesis, Functional verification;
**Gate Level Modeling:**
Introduction, Modeling using basic Verilog gate primitives, description of AND, OR, NOT type gates, Design of Flip – Flops with Gate Primitives, Delays

**UNIT-V:**
**Dataflow Modeling:**
Continuous assignments, delay specification, expressions, operators, operands, operator types;
**Behavioral Modeling:**
Structured procedures, initial and always, blocking and non-blocking statements, The Case Statement, for Loop, While Loop, Design of Flip flop, Shift register

**TEXT BOOKS:**


1. Kamran Eshraghian, Douglas A. Pucknell, Sholeh Eshraghian, Essentials of VLSI Circuits and Systems, Prentice, 2005.
2. Neil H. E Weste, David Harris, Ayan Banerjee, CMOS VLSI Design — A Circuits and Systems Perspective, Pearson, 2009.


**REFERENCE BOOKS:**


1. John P. Uyemura, CMOS logic circuit Design, Springer, 1999.
2. Lal Kishore K, Prabhakar V S V, VLSI Design, I.K International, 2010.
3. Mead & Convey, Introduction to VLSI, BS Publications, 2010.

**DIGITAL IMAGE PROCESSING**
**(Professional Elective-3)**

**IV B.Tech I-Semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. State the Digital Image Fundamentals and operation associated with various stages of image processing.
2. Illustrate the mathematics involved in various stages of image processing.
3. Demonstrate the operations various stages of image processing.
4. Contrast the different types of operation and its impact on images.
5. Understand the anatomy of image compression in Image Transmission.

**UNIT-I:**
**Fundamentals of Image Processing:**
Elements of Digital Image Processing Systems – Image sensing and Acquisition- Elements of Visual Perception – structure of human eye – light- luminance- brightness and contrast- image formation- Basic steps of image processing- Sampling -Quantization and Digital Image representation - Basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures..

**UNIT-II:**
**Image Enhancement in Spatial & frequency domain:**
**Image Enhancement in Spatial domain:**
Introduction-Point Processing-Histogram processing- Arithmetic and logical operations-Fundamentals of Spatial filtering-masking-Spatial filters for Smoothing - Spatial filters for Sharpening.
**Image Enhancement in Frequency domain:**
Need for transform-Basics of filtering in frequency domain-Image smoothing in frequency domain-Image sharpening in frequency domain

**UNIT-III:**
**Image Restoration:**
Introduction- Degradation model –Noise models-Spatial domain filtering for restoration- Mean Filters – Order Statistics filters – Adaptive filters –frequency domain filtering for noise removal - Band reject Filters – Band pass Filters – Notch Filters –Degradation function estimation– Inverse filtering – Wiener filter.

**UNIT-IV:**
**Image Segmentation and Morphological processing:**
**Image Segmentation:**
Segmentation concepts - Point - Line - Edge Detection-Thresholding based segmentation- Local-Global and Adaptive Thresholding- Region based segmentation-Region growing-Region splitting and merging.
**Morphological processing:**
Introduction- structuring element – erosion – dilation – Opening - closing.

**UNIT-V:**

**Image Compression:**

Introduction-Redundancy in images-Fidelity Criteria-Image compression model-Lossless compression-Huffman coding -Lossless Predictive coding- Lossy compression– lossy predictive coding- Transform coding –Image compression standards- JPEG and JPEG 2000.

**TEXT BOOKS:**


1. Rafael C. Gonzales, Richard E. Woods, Digital Image Processing, Pearson, 2010.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2005.


**REFERENCE BOOKS:**


1. Rafael C. Gonzalez, Richard E. Woods, Richard Eugene Woods, Steven L. Eddins, Digital Image processing using MATLAB, Tata McGraw Hill, 2010.
2. William K Pratt, Digital Image Processing, John Wiley & Sons, 2002.
3. Jayaraman S, Esakkirajan S, Veerakumar T, Digital Image processing, Tata McGraw Hill, 2011.

**CELLULAR AND MOBILE COMMUNICATIONS**
**(Professional Elective-3)**

**IV B.Tech I semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the principles of mobile communications, radio models, Antennas for Mobile communication, Equalization and applications.
2. Interpret the propagation models of Mobile and its effect on Antenna, Diversity and applications.
3. Relate the concepts of propagation models with channel interference
4. Explain the propagation models, channel interference, antenna design for the recent mobile systems
5. Recite the Handoff and Dropped calls in Cellular mobile communications.

**UNIT I:**

**Introduction to Cellular Mobile Radio Systems:**

Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

**Fundamentals of Cellular Radio System Design:**

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

**UNIT II:**

**Co-Channel Interference:**

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

**Non-Co-Channel Interference:**

Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Effects of Cell Site Components.

**UNIT III:**

**Cell Coverage for Signal and Traffic:**

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

**Cell Site and Mobile Antennas:**

Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

**UNIT IV:**

**Frequency Management and Channel Assignment:**

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

**UNIT V:**

**Handoffs and Dropped Calls:**

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

**TEXT BOOKS:**

1. Lee W.C.Y. , Mobile Cellular Telecommunications, Mc Graw Hill, 1989.
2. Theodre S Rappaport, Wireless Communications, Principles, Practice, Pearson Education India, 2009.

**REFERENCE BOOKS:**

1. Gordon L. Stuber, Principles of Mobile Communications, Springer, 2001.
2. Simon Haykin, Michael Moher, Modern Wireless Communications, Pearson, 2005.
3. Vijay Garg, Wireless Communications and Networking, Elsevier, 2007.

**RADAR ENGINEERING**
**(Professional Elective-3)**

**IV B.Tech I Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the concepts of radar fundamentals, noise analysis and evaluation of radar.
2. Differentiate various types of radar transmitters and receivers.
3. Relate the different types of radar transmitter and receiver.
4. Categorize the type of radar system and noise analysis based on applications.
5. Correlate the different methods of Radar Reception and Receivers.

**UNIT – I:**
**Basics of Radar:**
Introduction- Maximum Unambiguous Range- Radar Waveforms-- Radar Block Diagram and Operation- Radar Frequencies and Applications. Prediction of Range Performance - Minimum Detectable Signal- Receiver Noise.
**Radar Equation:**
Simple and Modified form of Radar Range Equation with Illustrative Problems - SNR- Envelop Detector-False Alarm Time and Probability- Integration of Radar Pulses- Radar Cross Section of Targets (simple targets - sphere- cone-sphere)- Transmitter Power- PRF and Range Ambiguities- System Losses (qualitative treatment)- Illustrative Problems.

**UNIT – II:**
**CW and Frequency Modulated Radar:**
Doppler Effect- CW Radar – Block Diagram- Isolation between Transmitter and Receiver- Non-zero IF Receiver- Receiver Bandwidth Requirements- Applications of CW radar- Illustrative Problems.
**FM-CW Radar:**
Range and Doppler Measurement- Block Diagram and Characteristics- FM-CW altimeter- Measurement Errors- Multiple Frequency CW Radar.

**UNIT – III:**
**MTI and Pulse Doppler radar:**
Introduction- Principle- MTI Radar with Power Amplifier Transmitter and Power Oscillator Transmitter- Delay Line Cancellers – Filter Characteristics- Blind Speeds- Double Cancellation- Staggered PRFs- Range Gated Doppler Filters- MTI Radar Parameters- Limitations to MTI Performance- MTI versus Pulse Doppler Radar.

**UNIT – IV:**
**Tracking Radar:**
Tracking With Radar- Sequential Lobing- Conical scan-Mono pulse Tracking Radar-Amplitude Comparison Mono pulse (One-And Two-Coordinates)-Phase Comparison Monopulse- Tracking In Range- Acquisition and Scanning Patterns- Comparison Of Trackers.

**UNIT – V:**
**Detection of Radar Signals in Noise:**
Introduction- Matched Filter Receiver-Response Characteristics and Derivation- Correlation Function and Cross-Correlation Receiver- Efficiency of Non-Matched Filters- Matched Filter with Non-White Noise.

**Radar Receivers:**
Noise Figure and Noise Temperature- Display-Types- Duplexers-Branch types And Balanced type- Circulators as Duplexers. Introduction to Phased Array Antennas-Basic concepts- Radiation Pattern- Beam Steering and Beam Width changes- Advantages and Limitations- Applications.

**TEXT BOOKS:**


1. Merrill I. Skolnik, Introduction to radar systems, Tata McGraw Hill special Indian edition, 2007.
2. Kulkarni M, Microwave and Radar Engineering, UMESH Publications, 2003.


**REFERENCE BOOKS:**


1. Byron Edde, Radar: Principles, Technology, Applications, Pearson, 2004.
2. Peyton Z. Peebles, Radar Principles, Wiley, 1998.
3. Mark A. Richards, James A. Scheer, William A. Holm-Yesdee, Principles of Modern Radar: Basic Principles, Institution of Engineering and Technology, 2013.

**BIOMEDICAL INSTRUMENTATION**
**(Professional Elective-4)**

**IV B.Tech I Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Summarize the requirement of biomedical instrumentation and adversity involved in human measurement.
2. Understand the concept of Bio Potentials in a Human Body
3. Utilize the concept of electrode and its responses used in real time.
4. Outline the divergent responses involved in cardiovascular and respiratory system.
5. Compare the various processes involved in bio telemetry.

**UNIT-I:**
**Introduction:**
The age of Biomedical Engineering, Development of Biomedical Instrumentation, Man–Instrumentation system, Components, Physiological system of the body, Problem encountered in measuring a living system. Transducers & Electrodes: The Transducers & Transduction principles, Active transducers, Passive Transducers, Transducer for Biomedical Applications.

**UNIT-II:**
**Sources of Bioelectric potentials:**
Resting & Action potentials, propagation of active potential, The Bioelectric potentials-ECG, EEG, EMG, and Invoked responses Electrodes: Electrode theory, Biopotential Electrodes–Microelectrodes Body surface electrodes, Needle Electrodes, Biochemical Transducers, Reference electrodes, PH electrodes, Blood Gas electrodes.

**UNIT-III:**
**Cardiovascular Measurements:**
Electrocardiography – ECG amplifiers, Electrodes & leads, ECG recorders - Three channel, Vector Cardiographs, ECG system for stress testing, Continuous ECG recording (Holterrecording ), Blood pressure measurement, Blood flow measurement, Heart sound measurements. Patient Care & Monitoring- Elements of Intensive Care monitoring, patient monitoring displays, Diagnosis, Calibration & Reparability of patient monitoring equipment, pacemakers & Defibrillators.

**UNIT-IV:**
**Measurements in Respiratory system:**
Physiology of respiratory system Measurement of breathing mechanics- Spiro meter, Respiratory Therapy equipment's: Inhalators ventilators & Respirators, Humidifiers, Nebulizers & Aspirators. Diagnostic Techniques: Ultrasonic Diagnosis Echocardiography, Echo Encephalography, Ophthalmic scans, X-Ray & Radio-isotope Instrumentation, Computerized Axial Tomography Scanners

**UNIT-V:**
**Bio Telemetry:**
The components of Biotelemetry system Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring. Physiological Effects of Electric Current Safety of Medical Electronic Equipments, Shock hazards from Electrical equipment and prevention against THEM.

**TEXT BOOKS:**


1. Leslie Cormwell, Biomedical Instrumentation and Measurements, Prentice Hall India,1980
2. Arumugam M, Biomedical Instrumentation, Anuradha Publications, 1994


**REFERENCE BOOKS:**


1. Khandpur R.S, Biomedical Instrumentation, Tata McGraw-Hill, 2003.
2. Willis J Tompkins, Biomedical DSP: C Language Examples and Laboratory Experiments for the IBM PC, Prentice Hall India, 2006.

**SATELLITE COMMUNICATIONS**
**(Professional Elective-4)**

**IV B.Tech I Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Demonstrate the historical background, basic concepts and frequency allocations for satellite communications.
2. Compare and contrast between various multiple accesses systems for satellite communication system.
3. Understand the propagation effects of signal in Satellite transmission
4. Design of satellite links for specified CNR.
5. Visualize satellite subsystems like telemetry, tracking, command and monitor power systems etc.

**UNIT-I:**
**Introduction to Satellite Communication:**
Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.
**Orbital Mechanics:**
Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, Evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day. Placement of Satellite in a Geo-stationary orbit

**UNIT-II:**
**Satellite sub systems:**
Attitude and orbit control system, TT& C subsystem, control subsystem, power systems, communication subsystems, satellite antenna equipment
**Satellite link:**
Basic Transmission Theory, System noise temperature and G/T ratio, Basic link analysis, Interference analysis , Design of satellite links for a specified C/N (with and without frequency reuse), Link budget

**UNIT – III:**
**Propagation effects:**
Introduction, Atmospheric Absorption, Cloud attenuation, Tropospeheric and Ionospheric scintillation, and low angle fading, Rain induced attenuation, Rain induced cross polarization interference.
**Multiple Access:**
Frequency division multiple access(FDMA), inter modulation, calculation of C/N, Time division multiple access(TDMA) – frame structure, Burst structure, Satellite switched TDMA, on-board processing, Demand Assignment multiple Access (DAMA), CDMA spread spectrum transmission and reception.

**UNIT – IV:**
**Earth station Technology:**
Transmitters, Receivers, Antenna, Tracking systems, Terrestrial interface, Power test methods, Lower orbit considerations. Satellite Navigation and Global Positioning systems: radio and satellite navigation, GPS position location principles, GPS receivers

**UNIT – V:**

**Typical Phenomena in Satellite Communication:**

Solar Eclipse on satellite and its effects, Remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

**TEXT BOOKS:**


1. Timothy pratt, Charles Bostian, Jeremy Allnutt , Satellite communications, John Wiley, 2003
2. Pritchand, Satellite communications engineering, Pearson, 1993.


**REFERENCE BOOKS:**


1. Madhavendra Richharia, Satellite communications: Design principles, Macmillan,2017
2. Tri T. Ha , Digital satellite communications, McGraw-Hill , 1990
3. Raja Rao K N, Fundamentals of satellite communications, Prentice Hall India, 2004

**TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS**

**(Professional Elective-4)**

**IV B.Tech I semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand different switching system methodologies, network traffic, networks and its applications.
2. Explain different signaling methods used in Telecommunication Networks.
3. Enumerate traffic in telecommunications network
4. Relate different data communication networks.
5. Demonstrate the applications of modern telecommunication concepts.

**UNIT – I:**

**Telecommunication Switching Systems:**

Introduction, Elements of switching systems, switching network configuration, Rotary switches, Uni selector, Two motion selector, Trucking principle ,principles of cross bar switching, Crossbar Switch Configuration, Cross point Technology, Crossbar Exchange Organization

**UNIT – II:**

**Electronic Space Division Switching:**

Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced services, Two-Stage Networks, Three-Stage Networks, n-Stage Networks.

**Time Division Switching:**

Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three Stage Combination Switching, n - Stage Combinational Switching.

**UNIT - III:**

**Telecommunications Traffic:**

Introduction, The Unit of Traffic, Congestion, Traffic Measurement, A Mathematical Model, Lost-Call Systems-Theory, Traffic Performance, Loss Systems in Tandem, Use of Traffic Tables, Queuing Systems-The Second Erlang Distribution, Probability of Delay, Finite Queue Capacity, Systems with a Single Server, Queues in Tandem, Delay Tables, Applications of Delay Formulae.

**UNIT – IV:**

**Telephone Networks:**

Subscriber loop systems, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, Signaling techniques: In channel signaling, common channel signaling, Cellular mobile telephony.

**Data Networks:**

Data transmission in PSTNs, Switching techniques for data transmission, data communication architecture, link to link layers, end to end layers, satellite based data networks, LAN, MAN, Internetworking

**UNIT – V:**

**Integrated Services Digital Network (ISDN):**

Introduction, motivation, new services, Network and protocol architecture, Transmission channels, User-Network interfaces, functional grouping, reference points, signaling, numbering, addressing, BISDN.

**SONET:**

Devices, Frame, Frame Transmission, Synchronous Transport Signals, STS I, Virtual Tributaries, and Higher rate of service.

**TEXT BOOKS:**


1. Thiagarajan Viswanathan, Telecommunication Switching Systems and Networks, Prentice Hall of India, 2010.
2. Flood J E, Telecommunications Switching, Traffic and Networks- Pearson, 2016.


**REFERENCE BOOKS:**


1. John. C. Bellamy, Digital Telephony, John Wiley, 2010.
2. Roger L. Freeman, Telecommunication System Engineering, John Wiley, 2010.
3. Achyut S. Godbole, Data Communications & Networks, Tata McGraw Hill, 2005

**AUTOMOTIVE ELECTRONICS**
**(Open Elective-3)**

**IV B.Tech I semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the working principles, characteristics and troubleshoot of automotive subsystem and its electronic engine control
2. Recite the basic idea behind Sensors and Actuators in Automotive Control System
3. Enumerate Digital Engine Control systems for Automobiles
4. Realization of Digital Engine Control Systems and control units in automotive systems
5. Interpret the concepts of Automotive Networking and Automotive Diagnostics

**UNIT -1:**

**Automotive Fundamentals Overview:**

Evolution of Automotive Electronics, Automobile Physical Configuration, Survey of Major Automotive Systems, The Engine – Engine Block, Cylinder Head, Four Stroke Cycle, Engine Control, Ignition System - Spark plug, High voltage circuit and distribution, Spark pulse generation, Ignition Timing, Diesel Engine, Drive Train - Transmission, Drive Shaft, Differential, Suspension, Brakes, Steering System , Starter Battery –Operating principle

**The Basics of Electronic Engine Control:**

Motivation for Electronic Engine Control – Exhaust Emissions, Fuel Economy, Concept of an Electronic Engine control system, Definition of General terms, Definition of Engine performance terms, Engine mapping, Effect of Air/Fuel ratio, spark timing and EGR on performance, Control Strategy, Electronic Fuel control system, Analysis of intake manifold pressure, Electronic Ignition.

**UNIT-II:**

**Automotive Control System applications of Sensors and Actuators:**

Typical Electronic Engine Control System, Variables to be measured

**Automotive Sensors:**

Airflow rate sensor, Strain Gauge MAP sensor, Engine Crankshaft Angular Position Sensor, Magnetic Reluctance Position Sensor, Hall effect Position Sensor, Shielded Field Sensor, Optical Crankshaft Position Sensor, Throttle Angle Sensor (TAS), Engine Coolant Temperature (ECT) Sensor, Exhaust Gas Oxygen (O2/EGO) Lambda Sensors, Piezoelectric Knock Sensor.

**Automotive Actuators:**

Solenoid, Fuel Injector, EGR Actuator, Ignition System

**UNIT –III:**

**Digital Engine Control Systems:**

Digital Engine control features, Control modes for fuel Control (Seven Modes), EGR Control, Electronic Ignition Control - Closed loop Ignition timing, Spark Advance Correction Scheme, Integrated Engine Control System - Secondary Air Management, Evaporative Emissions Canister Purge, Automatic System Adjustment, System Diagnostics.

**Control Units:**

Operating conditions, Design, Data processing, Programming, Digital modules in the Control unit, Control unit software.

**UNIT –IV:**

**Automotive Networking:**

Bus Systems – Classification, Applications in the vehicle, Coupling of networks, Examples of networked vehicles , Buses - CAN Bus, LIN Bus, MOST Bus, Bluetooth, Flex Ray, Diagnostic Interfaces

**Vehicle Motion Control:**

Typical Cruise Control System, Digital Cruise Control System, Digital Speed Sensor, Throttle Actuator, Digital Cruise Control configuration, Cruise Control Electronics (Digital only), Antilock Brake System (ABS)

**UNIT –V:**

**Automotive Diagnostics:**

Timing Light, Engine Analyzer, On-board diagnostics, Off board diagnostics, Expert Systems, Occupant Protection Systems – Accelerometer based Air Bag systems.

**Future Automotive Electronic Systems:**

Alternative Fuel Engines, Electric and Hybrid vehicles, Fuel cell powered cars, Collision Avoidance Radar warning Systems, Low tire pressure warning system, Heads Up display, Speech Synthesis, Navigation – Navigation Sensors - Radio Navigation, Signpost navigation, dead reckoning navigation, Voice Recognition Cell Phone dialing, Advanced Cruise Control, Stability Augmentation, Automatic driving Control

**TEXT BOOKS:**


1. William B. Ribbens, Understanding Automotive Electronics an Engineering Perspective, Elsevier Science, 2017.
2. Robert Bosch Gmbh, Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, Springer Fachmedien Wiesbaden, 2013.


**REFERENCE BOOKS:**


1. Babu A K, Automotive Electrical and Electronics, Khanna Publishing, 2018
2. William B. Ribbens, Norman P. Mansour, Charles W. Battle, Understanding Automotive Electronics Radio Shack, 1980
3. Graham Stoakes , Automotive Master Technician: Advanced Light Vehicle Technology , Graham Stoakes, 2015

**INTRODUCTION TO COMMUNICATION ENGINEERING**
**(Open Elective -3)**

**IV B.Tech I semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the working principles, characteristics and applications of different modulation techniques
2. Recite the basic concepts behind the satellite communications
3. Enumerate the principles of Cellular mobile communications
4. Realization of the principle of operation and its applications of radar systems
5. Interpret the concept of Wireless LAN technologies which support for wireless communication

**UNIT- I:**
**Basics of Communication Engineering:**
Introduction to communication systems – Need for modulation – AM – FM - PM modulation – Digital modulation fundamentals – PCM-DPCM- Delta Modulation – properties -PSK,FSK,ASK – types techniques –properties

**UNIT -II:**
**Satellite communication:**
**Satellite Orbits and Trajectories:** Definition, Basic Principles, Orbital parameters, Types of Satellite orbits, Orbital perturbations, Satellite stabilization, Orbital effects on satellite's performance, Eclipses, Look angles: Azimuth angle, Elevation angle.
**Satellite subsystem:** Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload.
**Earth Station:** Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking.

**UNIT-III:**
**Cellular and Mobile communications:**
The cellular concept – Frequency reuse – Interference and system capacity – Trunking and Grade of service – Improving coverage and capacity in cellular systems - Handoff - Roaming management - Handoff detection – channel Assignment techniques - GSM Network signaling - GSM Mobility management GSM short message service - International roaming for GSM - GSM operation, Mobile number Mobile number portability's, VoIP service for mobile networks.

**UNIT-IV:**
**Radar Engineering:**
Introduction, Maximum Unambiguous Range, Radar Waveforms, Definitions with respect to pulse waveform - PRF, PRI, Duty Cycle, Peak Transmitter Power, Average transmitter Power. Simple form of the Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of Radar, The Origins of Radar,

**UNIT –V:**
**Wireless Networks:**
Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation

**TEXT BOOKS:**

1. Kennedy, Electronic Communication Systems, Tata McGraw-Hill – 1999.
2. Yi-Bing Lin and Imrichchlantae, —Wireless and Mobile Network Architecturell, John Wiley 2006.

**REFERENCE BOOKS:**

1. Satellite Communications, by Dennis Roddy (Fourth edition), McGraw Hill.
2. Yi-Bing Lin and Imrich Chlantae, Wireless and Mobile Network Architecture, John Wiley, 2006
3. Haykin S, Digital Communications, John Wiley, 2005

## EMBEDDED& VLSI LABORATORY

**IV B.Tech I Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Code the ARM cortex M0+ processor instruction set.
2. Articulate the concept of interfacing I/O devices with FRDM kit.
3. Synthesize a Verilog code for digital circuits
4. Devise the digital circuit in CPLD/FPGA
5. Formulate a system design using Embedded and VLSI technologies

**Perform any 10 Experiments from each lab:**

**Embedded System Design Lab:**

1. Blinking of LED : Hello World
2. Breath out 2 LEDs
3. Color Circle
4. ADC Potentiometer
5. Analog serial plotter
6. Interface to Accelerometer sensor using FRDM kit
7. Serial port communication using FRDM kit
8. Interface to touch sensor using FRDM kit
9. Radio frequency transmission operation using FRDM kit
10. LED intensity control using touch sensor using FRDM kit
11. Interface and plot LDR using FRDM kit
12. Interface and plot temperature sensor using FRDM kit

**VLSI lab:**

1. Verification of Logic Gates
2. Verification of Demorgon's Law
3. Design of 8 to 1 multiplexer
4. Design of 1 to 8 Demultiplexer
5. Design of 2 to 4 Encoder
6. Design of 4-bit comparator
7. Design of 4 bit binary to gray converter
8. Design of full adder using 3 modeling styles
9. Design of flip flops SR, D, JK, and T
10. Design Ripple Counter
11. Design Modulo Counter
12. Design Shift Register
13. Design Inverter using PMOS / NMOS
14. Design of full adder using decoder and multiplexer
15. Design System using finite state Machine

## ANTENNA AND MICROWAVE ENGINEERING LABORATORY

**IV B.Tech I Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Contrast the different ways of measuring antenna parameters.
2. Differentiate the different Radiation pattern of the antennas
3. Study the characteristics of various microwave components
4. Articulate the performance of Microwave components
5. Formulate a antenna design using Antenna and Microwave technologies

**PART — A:** (SOFTWARE) (ANY 6 EXPERIMENTS):

1. Measurement of Radiation pattern and gain of simple Dipole antenna
2. Measurement of Radiation pattern and gain of Half wave Dipole antenna
3. Measurement of Radiation pattern and gain of folded dipole antenna
4. Measurement of Radiation pattern and gain of horn antenna
5. Measurement of Radiation pattern and gain of microstrip patch antenna
6. Measurement of Radiation pattern and gain of Yagi - Uda antenna
7. To study and plot the radiation pattern of cut parabolic antenna with simpledipole feed
8. To study various types of parabolic reflectors and their feed systems

**PART — B:** (HARDWARE) (ANY 6 EXPERIMENTS):

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement
5. Measurement of Waveguide Parameters
6. Measurement of Scattering parameters of a Magic Tee
7. Measurement of Scattering parameters of a Circulator
8. Attenuation Measurement

## INDUSTRY ORIENTED MINI PROJECT

**IV B.Tech I semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the working environment of an Industry
2. Create an avenue in the industry in terms of a mini project
3. Predict a timeline for the project
4. Evaluate the requirements of the projects in terms of different subsystems
5. Create a dissemination report for the mini project

**METHOD OF EVALUATION:**

The students in a group of 4 to 5 works on an industry oriented topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

## ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

**IV B.Tech II semester**

| L | T | P | C |
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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Acquire knowledge in Characteristics of Instruments, measurement on non-electrical quantities
2. Analyze the performance of various measuring systems based on the response to the given inputs.
3. Design electronic instrumentation systems according the required specifications
4. Apply different principles to measure a quantity and to provide wide range of solutions for the problems in real time world
5. Recite the acquisition of Non Electrical quantities in a system.

**UNIT-I:**
**Measurements and measuring systems:**
Functional Diagram of Instrumentation System, Static characteristics: Accuracy Precision Resolution Sensitivity measurement Errors, Dynamic Characteristics: Speed of response fidelity Lag - Dynamic error Statistical Analysis, Basic meter movement, Ammeters: Multi-range Universal Shunt, DC voltmeters: Multi-range Range extension Loading Transistorized Voltmeter, AC voltmeters: Rectifier type Thermocouple Type, Ohmmeters: Series type and Shunt type, Multimeter: Voltage Current Resistance measurements.

**UNIT-II:**
**Oscilloscopes and signal generators:**

**Oscilloscopes:**
Oscilloscope block diagram, Cathode Ray Tube, Vertical Deflection System, Delay Line, Horizontal Deflection System: Triggered Sweep - Delayed sweep, CRO Probes, Dual Beam CRO, Dual Trace CRO, Measurements with CRO: Amplitude – Time period - Frequency – Phase, Lissajous patterns, Sampling Oscilloscope, Analog Storage Oscilloscope, Digital Storage Oscilloscope.

**Signal Generators:**
Fixed and variable AF generators, AF Sine & Square wave generator, Function generators, Fixed and variable RF signal generators, Sweep frequency generator.

**UNIT-III:**
**Signal analyzers:**
Wave analyzers: Frequency Selective Wave Analyzer - Heterodyne Wave Analyzer - Application of Wave Analyzers, Harmonic Distortion Analyzers: Total Harmonic Distortion, Spectrum Analyzer.

**UNIT-IV:**
**Bridges and transducers:**
**Bridges:**
Wheat Stone Bridge, Kelvin Bridge, Maxwell Bride, Schering Bridge and Wien Bridge.

**Transducers:**
Classification of Transducers, Potentiometers, Strain gauges, Capacitive Transducers, Linear Variable Differential Transducer (LVDT), Piezoelectric Transducer, Thermocouple, Thermistor, Resistance Thermometer.

**UNIT-V:**

**Measurement of Non Electrical Quantities Data Acquisition Systems:**
Measurement of Displacement, Velocity, Acceleration, Vibration, Force, Pressure, Fluid Flow, Liquid Level and Temperature. Data Acquisition System: Generalized Data Acquisition System - Configuration of DAS Single Channel & Multi Channel DAS, Strip Chart Recorder, X-Y Recorder

**TEXT BOOKS:**


1. Albert D. Helfrick, Cooper William D, Modern Electronic Instrumentation and Measurement Techniques, Prentice-Hall of India, 1997.
2. Sawhney A K, Puneet Sawhney , A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Company, 2016


**REFERENCE BOOKS:**


1. David A. Bell, Electronic Instrumentation & Measurements, Prentice-Hall, 2003.
2. Kalsi H S, Electronic instrumentation, Tata Mcgraw Hill, 2015.
3. Lal Kishore K, Electronic Measurements and Instrumentation, Pearson, 2009.

## WIRELESS COMMUNICATIONS AND NETWORKS

**IV B.Tech II Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Infer the basic concepts of different Access techniques, data service, technology and standards associated with wireless communication networks
2. Distinguish the multiple access techniques, standards, Technology used in wireless Communication and networks
3. Interpret the recent wireless standards on communications and networks.
4. Appraise the various wireless networks in communication systems.
5. Distinguish the different wireless networks.

**UNIT –I:**

**Cellular Concept-System Design Fundamentals:**

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

**UNIT –II:**

**Mobile Radio Propagation and Large-Scale Path Loss:**

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Log-distance path loss model

**UNIT –III:**

**Mobile Radio Propagation:**

Small –Scale Fading and Multipath Small Scale propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading,

**UNIT –IV:**

**Equalization and Diversity:**

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Nonlinear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration- Selection Diversity, Feedback or Scanning Diversity, Frequency Diversity, Time Diversity.

**UNIT –V:**

**Wireless Networks:**

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper LAN, WLL.

**TEXT BOOKS:**


1. Theodre S Rappaport , Wireless Communications, Principles, Practice, Pearson Education India, 2009
2. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2005.


**REFERENCE BOOKS:**


1. Kamilo Feher, Wireless Digital Communications, Prentice-Hall, 1999.
2. William Stallings, Wireless Communication and Networking, Pearson Education, 2003.
3. KavehPah Laven and P. Krishna Murthy, Principles of Wireless Networks, Wiley, 2002.

## TECHNICAL SEMINAR

**IV B.Tech II Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Synthesizing information on any one specialized topic from text books, peer revised journals, hand books and other technical resources.
2. Accumulate information regarding the topic
3. Create a presentation to disseminate the accumulated data as presentation
4. Generation a technical seminar report comprising of all relevant information with stipulated standards.
5. Evaluate the intensity of topic in real time

**METHOD OF EVALUATION:**

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

## COMPREHENSIVE VIVA VOCE

**IV B.Tech II Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Remember the basics of Electronics and communication Engineering
2. Understand the different methods of analyzing the circuits
3. Recite the importance of Electronics and communication in terms of application
4. Recap the knowledge of the subjects through modern applications
5. Comprehensive understanding of the subject

**METHOD OF EVALUATION:**

Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department along with an external examiner. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he/she studied during the B. Tech. course of study. The Comprehensive VivaVoce is evaluated by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

## MAJOR PROJECT

**IV B.Tech II Semester**

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**COURSE OUTCOMES:**

At the end of the course the student should be able to

1. Understand the basics of project management
2. Identify an area of project work through extensive literature survey
3. Formulation of Ideas from the survey
4. Presentation of ideas in terms of presentation
5. Create a dissemination report for the project done

**METHOD OF EVALUATION:**

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.