# ANNAMALAI UNIVERSITY

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

**(Four Year Degree Programme)**

**(Choice Based Credit System)**

**(FULL–TIME)**

## REGULATIONS AND SYLLABUS

## REGULATIONS

### 1. Condition for Admission

Candidates for admission to the first year of the four year B.E. Degree programmes shall be required to have passed the final examination of the plus 2 Higher Secondary Course with Mathematics, Physics and Chemistry as subjects of study and candidates who have passed the Higher Secondary Examination through vocational stream under Engineering, conducted by the Board of Secondary Education, Government of Tamilnadu or an examination of any other authority accepted by the Syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks, age and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time.

Candidates who have passed the Diploma course in Engineering of the State Board of Technical Education, TamilNadu (listed in Annexure-1) will be eligible for admission to the second year of the four year degree programme in B.E. under the lateral entry scheme provided they satisfy other conditions.

### 2. Branches of Study in B.E.

| | |
|---|---|
| BRANCH I | - Civil Engineering |
| BRANCH II | - Civil and Structural Engineering |
| BRANCH III | - Mechanical Engineering |
| BRANCH IV | - Mechanical Engineering (Manufacturing) |
| BRANCH V | - Electrical and Electronics Engineering |
| BRANCH VI | - Electronics and Instrumentation Engineering |
| BRANCH VII | - Chemical Engineering |
| BRANCH VIII | - Computer Science and Engineering |
| BRANCH IX | - Information Technology |
| BRANCH X | - Electronics and Communication Engineering |

### 3. Courses of Study

The courses of study and the respective syllabi are given separately.

### 4. Scheme of Examinations

The scheme of Examinations is given separately.

### 5. Choice Based Credit System (CBCS)

The curriculum includes six components namely Humanities/Social Sciences/Management, Basic Sciences, Engineering Sciences, Professional Core, Professional Electives and Open Electives in addition to Seminar & Industrial Training and Project. Each semester curriculum shall normally have a blend of

theory and practical courses. The total credits for the entire degree Programme is 176 (135 for lateral entry students).

**6. Eligibility for the Degree**

A candidate shall be eligible for the degree of Bachelor of Engineering if the candidate has satisfactorily undergone the prescribed courses of study for a period of four academic years and has passed the prescribed examinations in all the four academic years. For the award of the degree, a student has to

1. Earn a minimum of 176 credits (135 for lateral entry students).
2. Serve in any one of the Co-curricular activities such as

- National Cadet Corps (NCC)
- National Service Scheme (NSS)
- National Sports Organization (NSO) and
- Youth Red Cross (YRC)

for at least one year. The students enrolled in any one of the co-curricular activities ( NCC / NSS / NSO / YRC ) will undergo training for about 80 hours and attend a camp of about seven days. The training shall include classes on hygiene and health awareness and also training in first-aid. While the training activities will normally be during weekends, the camp will normally be during vacation period.

(OR)

Enroll as a student member of a recognized professional society such as

- Student Chapters of Institution of Engineers (India)
- Student Chapters of other Professional bodies like ICI, ISA, IIChE

**7. Assignment of Credits for Courses**

Each course is normally assigned one credit per hour of lecture / tutorial per week and one credit for two hours or part thereof for laboratory or practical or drawing per week.

**8. Duration of the programme**

A student is normally expected to complete the B.E. programme in four years but in any case not more than eight years from the time of admission.

**9. Registration for courses**

A newly admitted student will automatically be registered for all the courses prescribed for the first, second and third semesters without any option.

Every other student shall enroll for the courses intended to be credited in the succeeding semester in the current semester itself by completing the registration form indicating the list of courses. This registration will be done a week before the last working day of the current semester.

A student is required to earn 176 (135 for lateral entry students) credits in order to be eligible for obtaining the degree. However the student is entitled to enjoy an option to earn either more or less than the total number of credits prescribed in the curriculum of a particular semester on the following guidelines:

The slow learners may be allowed to withdraw certain courses with the approval by Head of the Department and those courses may be completed by them in the fifth year of study and still they are eligible to be awarded with I Class. A student can withdraw a maximum of 2 courses per semester from IV semester to

VII semester and take up those courses in the fifth year of study. However, courses withdrawn during odd semesters (V and VII) must be registered in the odd semester of fifth year and courses withdrawn during even semesters (IV and VI) must be registered in the even semester of fifth year.

The advance learners may be allowed to take up the open elective subjects of eighth semester in sixth and seventh semesters one in each to enable them to pursue industrial training / project work in the entire eighth semester period provided they should register those courses in the fifth semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

**10. Seminar / Industrial Training**

The student has to present a seminar on the chosen topic. However, the student can select a topic duly approved by the Seminar Coordinator and the Head of the Department concerned. The student who has presented the seminar has to submit a report and appear for viva-voce examination at the end of the semester.

**11. Project Work**

The student typically registers for project at the end of seventh semester and completes it at the end of the eighth semester along with the courses prescribed for study in the eighth semester. However a student who has registered and successfully completed the courses of eighth semester by acquiring additional credits in the earlier semesters can attempt to spend his / her period of study in an industry and complete his / her project work, submit the project report and appear for viva-voce examination at the end of eighth semester.

**12. Industrial Training (Value added courses)**

One credit courses shall be offered by a Department with the prior approval from the Dean, Faculty of Engineering and Technology. For one credit course, a relevant potential topic may be selected by a committee consisting of Head of the department concerned and the Board of Studies member from the Department and a senior faculty member from the department concerned. An expert from industry familiar with the topic chosen may be accordingly invited to handle classes for the students. The details of the syllabus, time table and the name of the industrial expert may be sent by the above committee to the Dean for approval. The credits earned through the one credit courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. Students can take a maximum of two one credit courses (one each in VI and VII semesters). They shall be allowed to take one credit courses offered in other Departments with the permission of Head of the Department offering the course. A separate mark sheet shall be issued for one credit courses.

**13. Electives**

The elective courses fall under two categories: Professional Electives and Open Electives. The Professional Elective courses are offered in the concerned branch of specialization and a student can choose the Professional Elective courses with the approval of the Head of the Department concerned. Apart from the various Professional elective courses, a student can choose the open electives from any specialization offered in any Department in the Faculty of Engineering &

Technology during the entire period of study, with the approval of the Head of the Department and the Head of the Department offering the course.

Further, the student can also credit not more than two courses offered through the SWAYAM Portal of UGC with the approval of the Head of the Department concerned. These courses will be considered as equivalent of open electives.

**14. Assessment**

The break-up of continuous assessment and examination marks for theory courses is as follows:

| | |
|---|---|
| First assessment (Mid-Semester Test-I) | : 10 marks |
| Second assessment (Mid-Semester Test-II) | : 10 marks |
| Third Assessment | : 5 marks |
| End Semester Examination | : 75 marks |

The break-up of continuous assessment and examination marks for Practical courses is as follows:

| | |
|---|---|
| First assessment (Test-I) | : 15 marks |
| Second assessment (Test-II) | : 15 marks |
| Maintenance of record book | : 10 marks |
| End Semester Examination | : 60 marks |

The continuous assessment marks for the seminar / industrial training will be 40 and to be assessed by a seminar committee consisting of the Seminar Coordinator and a minimum of two members nominated by the Head of the Department. The continuous assessment marks will be awarded at the end of seminar session. 60 marks are allotted for the seminar / industrial training and viva voce examination conducted based on the seminar / industrial training report at the end of the semester.

The continuous assessment marks for the project work will be 40 and to be assessed by a review committee consisting of the project guide and a minimum of two members nominated by the Head of the Department. One of the committee members will be nominated as the Chairman by the Head of the Department. The Head of the Department may be a member or the Chairman. At least two reviews should be conducted during the semester by the review committee. The student shall make presentation on the progress made before the committee. 60 marks are allotted for the project work and viva voce examination at the end of the semester.

**15. Substitute Assessment**

A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the final examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Dean / Head of the Department within a week from the date of the missed assessment.

**16. Student Counsellors (Mentors)**

To help the students in planning their course of study and for general advice on the academic programme, the Dean / Head of the Department will attach a certain

number of students to a member of the faculty who shall function as student counsellor for those students throughout their period of study. Such student counsellors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Dean / Head of the Department.

**17. Class Committee**

For all the branches of study during the first two semesters, a common class committee will be constituted by the Dean of the faculty. From among the various teachers teaching the same common course to different classes during each semester of the first year, the Dean shall appoint one of them as course coordinator. The composition of the class committee during first and second semesters will be as follows:

- Course coordinators of all courses.
- All Heads of the Sections, among whom one may be nominated as Chairman by the Dean.
- The Dean may opt to be a member or the Chairman.

For each of the higher semesters, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from third to eighth semester will be as follows:

- Teachers of the individual courses.
- A seminar coordinator (for seventh semester only) shall be appointed by the Head of the Department
- A project coordinator (for eighth semester only) shall be appointed by the Head of the Department from among the project supervisors.
- One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.

The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory / 40 marks for seminar / industrial training, practical and project work will be finalized for every student and tabulated and submitted to the Head of the Department (to the Dean in the case of I & II Semester) for approval and transmission to the Controller of Examinations.

**18. Attendance requirements**

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

**19. Temporary break of study**

A student is permitted to go on break of study for a maximum period of one year either as two breaks of one semester each or a single break of one year.

The student applies for break of study, the student shall apply to the Dean in advance, in any case, not later than the last date of the first assessment period. The application duly filled by the student shall be submitted through the Head of the Department. In the case of short term employment/ training/ internship, the application for break of study shall be approved and forwarded by the Head of the department concerned to the Dean.

However, the student must complete the entire programme within the maximum period of eight years.

**20. Procedure for withdrawing from the Examinations**

A student can withdraw from all the examinations of the semester only once during the entire programme on valid grounds accepted by the University. Such withdrawal from the examinations of a semester will be permitted only if the candidate applies for withdrawal at least 24 hours before the commencement of the last examination. The letter grade 'W' appears in the mark sheet for such candidates.

**21. Passing and declaration of examination results**

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the Controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), and prepare the mark sheets.

| | | |
|---|---|---|
| 90 to 100 marks | : | Grade 'S' |
| 80 to 89 marks | : | Grade 'A' |
| 70 to 79 marks | : | Grade 'B' |
| 60 to 69 marks | : | Grade 'C' |
| 55 to 59 marks | : | Grade 'D' |
| 50 to 54 marks | : | Grade 'E' |
| Less than 50 marks | : | Grade 'RA' |
| Withdrawn from the examination | : | Grade 'W' |

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S,A,B,C,D or E for a course is declared to have successfully completed that course. Such a course cannot be repeated by the student.

A student who is detained for lack of attendance must re-register for and repeat the courses in the respective semester.

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; RA - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

CGPA is similarly calculated considering all the courses taken from the time of admission.

**22. Awarding degree**

After successful completion of the programme, the degree will be awarded with the following classification based on CGPA.

- For First Class with Distinction, the student must earn a minimum of 176 credits within four years (135 credits within three years for lateral entry students) for from the time of admission , pass all the courses in the first attempt and obtain a CGPA of 8.25 or above for all the subjects from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).
- For First Class, the student must earn a minimum of 176 credits within five years (135 credits within four years for lateral entry students) from the time of admission and obtain a CGPA of 6.75 or above for all the subjects from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students)..
- For Second Class, the student must earn a minimum of 176 credits within eight years (135 credits within seven years for lateral entry students) from the time of admission.

**23. Ranking of Candidates**

The candidates who are eligible to get the B.E. degree in the First Class with Distinction will be ranked together on the basis of CGPA for all the subjects of study from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).

The Candidates passing with First Class will be ranked next after those with distinction on the basis of CGPA for all the subjects of study from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).

The ranking of candidates will be done separately for each branch of study.

**24. Transitory Regulations**

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

Wherever there had been change of syllabi, examinations based on the existing syllabi will be conducted for three consecutive times after implementation of the new syllabi in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent courses, as per the new syllabi, on the recommendations of the Head of the Department concerned.

## Annexure-1

## Diploma Programmes Eligible for the B.E (Lateral Entry) Programmes offered in FEAT (from 2017-2018)

| Sl. No. | Branches of Study | Eligible Diploma Programme (FT / PT / SW) |
|---|---|---|
| 1. | **Civil Engineering** | i. Civil Engineering<br>ii. Civil Engineering(Architecture)<br>iii. Environmental Engineering and Pollution Control(Full Time) |
| 2. | **Civil and Structural Engineering** | iv. Architectural Assistantship<br>v. Civil Engineering (Rural Tech.)<br>vi. Civil and Rural Engineering |
| 3. | **Mechanical Engineering** | i. Mechanical Engineering<br>ii. Mechanical and Rural Engineering<br>iii. Mechanical Design and Drafting<br>iv. Production Engineering<br>v. Production Technology<br>vi. Automobile Engineering<br>vii. Automobile Technology<br>viii. Metallurgy<br>ix. Mechatronics Engineering<br>x. Machine Tool Maintenance and Repairs<br>xi. Tool and Die making<br>xii. Tool Engineering<br>xiii. Tool Design<br>xiv. Foundry Technology<br>xv. Refrigeration and Air Conditioning<br>xvi. Agricultural Engineering<br>xvii. Agricultural Technology<br>xviii. Marine Engineering<br>xix. Mechanical Engineering(Production)<br>xx. Mechanical Engineering(Tool &Die)<br>xxi. Mechanical Engineering (Foundry)<br>xxii. Mechanical Engineering(R & A.C.)<br>xxiii. Electronics(Robotics)<br>xxiv. Mining Engineering<br>xxv. Agricultural Engineering and Farm<br>xxvi. Equipment Technology |
| 4. | **Mechanical Engineering (Manufacturing Engineering)** | |
| 5. | **Electrical and Electronics Engineering** | i. Electrical and Electronics Engineering<br>ii. Electronics and Communication Engg.<br>iii. Electronics and Instrumentation Engg<br>iv. Electronics Engineering(Instrumentation)<br>v. Instrument Technology<br>vi. Instrumentation and Control Engineering<br>vii. Electrical Engineering (Instruments and Control)<br>viii. Electrical Engineering<br>ix. Instrumentation Technology<br>x. Electronics (Robotics)<br>xi. Mechatronics Engineering |
| 6. | **Electronics and Instrumentation Engineering** | |

| Sl. No. | Branches of Study | Eligible Diploma Programme (FT / PT / SW) |
|---|---|---|
| 7. | **Chemical Engineering** | i. Petrochemical Engineering<br>ii. Chemical Engineering<br>iii. Environmental Engineering and Pollution Control<br>iv. Leather Technology (Footwear)<br>v. Leather Technology<br>vi. Plastic Technology<br>vii. Polymer Technology<br>viii. Sugar Technology<br>ix. Textile Technology<br>x. Chemical Technology<br>xi. Ceramic Technology<br>xii. Petro Chemical Technology<br>xiii. Pulp & Paper Technology<br>xiv. Petroleum Engineering |
| 8. | **Computer Science and Engineering** | i. Electronics and Communication Engineering<br>ii. Computer Technology<br>iii. Computer Science and Engineering<br>iv. Information Technology<br>v. Computer Engineering<br>vi. Computer Networking<br>vii. Electronics(Robotics)<br>viii. Mechatronics Engineering |
| 9. | **Information Technology** | |
| 10. | **Electronics and Communication Engineering** | |

FT – Full Time; PT – Part Time; SW – Sandwich.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
## Proposed Curriculum for B.E. (Electronics and Communication Engineering)
## (2016-2017 Onwards)

**Data Summary**

| Semester | No. of Courses | | HS | BS | ES | PC | PE | OE | S&IT | Project | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | T+P | Total | | | | | | | | | |
| I | 4+2 | **6** | 3<br>1 | 9<br>3 | 5<br>2 | - | - | - | - | - | 17 |
| II | 4+4 | **8** | 4<br>1 | 13<br>5 | 7<br>2 | - | - | - | - | - | 24 |
| III | 6+2 | **8** | 3<br>1 | 4<br>1 | 8<br>3 | 8<br>3 | - | - | - | - | 23 |
| IV | 6+2 | **8** | - | 4<br>1 | 3<br>1 | 16<br>6 | - | - | - | - | 23 |
| V | 6+3 | **9** | - | - | - | 17<br>6 | 8<br>3 | - | - | - | 25 |
| VI | 6+3 | **9** | - | - | - | 10<br>4 | 11<br>4 | 3<br>1 | - | - | 24 |
| VII | 5+3 | **8** | 3<br>1 | - | - | 5<br>2 | 8<br>3 | 3<br>1 | 1<br>1 | - | 20 |
| VIII | 2+1 | **3** | - | - | - | - | - | 6<br>2 | -<br>- | 14<br>1 | 20 |
| **Total Courses** | **39+20** | **59** | **4** | **10** | **8** | **21** | **10** | **4** | **1** | **1** | **-** |
| **Total credits** | | **-** | **13** | **30** | **23** | **56** | **27** | **12** | **1** | **14** | **176** |

| Code | Details | Code | Details |
|---|---|---|---|

| | | | |
|---|---|---|---|
| HS | Humanities Theory | CP | Professional Core Practical |
| HP | Humanities Practical | PE | Professional Elective Theory |
| BS | Basic Science Theory | EP | Professional Elective Practical |
| BP | Basic Science Practical | ST | Seminar / Industrial Training |
| ES | Engineering Science Theory | OE | Open Elective Theory |
| SP | Engineering Science Practical | PV | Project and Viva-voce |
| PC | Professional Core Theory | | |

## B.E. (Four Year) DEGREE PROGRAMME
## Choice Based Credit System (CBCS)
## Courses of Study and Scheme of Examinations
## FIRST SEMESTER

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | HS-I | 00HS101 | Technical English | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | BS-I | 00BS102 | Engineering Mathematics I | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | BS-II | 00BS103 | Applied Physics I | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | BS-III | 00BS104 | Applied Chemistry I | 4 | - | - | 75 | 25 | 100 | 3 |
| **5** | **ES-I Lab** | 00SP105 | **Computer Programming Laboratory** | **-** | **1** | **3** | **60** | **40** | **100** | **3** |
| **6** | **ES-II Lab** | 00SP106 | **Engineering Workshop** | **-** | **-** | **3** | **60** | **40** | **100** | **2** |
| | | | **Total** | **16** | **1** | **6** | **420** | **180** | **600** | **17** |

## SECOND SEMESTER

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BS-IV | 00BS201 | Engineering Mathematics II | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | BS-V | 00BS202 | Applied Physics II | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | BS-VI | 00BS203 | Applied Chemistry II | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | ES-I | 00ES204 | Basic Engineering* | 4 | | - | 75 | 25 | 100 | 3 |
| 5 | HS-II | 00HP205 | Communication Skills and Language Laboratory | - | 2 | 3 | 60 | 40 | 100 | 4 |
| **6** | **BS-I Lab** | 00BP206 | **Applied Physics Laboratory** | **-** | **-** | **3** | **60** | **40** | **100** | **2** |
| **7** | **BS-II Lab** | 00BP207 | **Applied Chemistry Laboratory** | **-** | **-** | **3** | **60** | **40** | **100** | **2** |
| **8** | **ES-III Lab** | 00SP208 | **Engineering Graphics** | **-** | **2** | **3** | **60** | **40** | **100** | **4** |
| | | | **Total** | **16** | **4** | **12** | **540** | **260** | **800** | **24** |

*** Basic Civil Engg. Course** for Mech., Manuf., EEE, EIE, ECE, CSE & IT

**Basic Electrical Engg. Course** for Civil, Civil and Structural, Mech., Manuf.,& Chem. Engg.

**Basic Mechanical Engg. Course** for Civil, Civil and Structural, EEE, EIE, ECE, CSE, IT & Chem. Engg.

**L**-Lecture; **T**-Tutorial; **P**-Practical.

**Exam**-End Semester Examination; **CA**-Continuous Assessment

## THIRD SEMESTER

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | HS - III | 00HS301 | Environmental Studies | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | BS-VII | 00BS302 | Engineering Mathematics – III | 4 | 1 | - | 75 | 25 | 100 | 4 |
| 3 | ES-II | 00ES303 | Engineering Mechanics | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | ES-III | 10ES304 | Basic Electronics Engineering | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PC-I | 10PC305 | Network Theory | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | PC-II | 10PC306 | Electromagnetic Fields | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | ES-IV Lab | 10SP307 | Basic Electronics Engineering Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-I Lab | 10CP308 | Circuits and Networks Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **1** | **6** | **570** | **230** | **800** | **23** |

**FOURTH SEMESTER**

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BS - VIII | 10BS401 | Probability , Random Process and Numerical Methods | 4 | 1 | - | 75 | 25 | 100 | 4 |
| 2 | ES-IV | 10ES402 | Materials Science | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | PC-III | 10PC403 | Electronic Circuits | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | PC-IV | 10PC404 | Digital Electronics | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PC-V | 10PC405 | Transmission Lines and Waveguides | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | PC-VI | 10PC406 | Signals and Systems | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | PC-II Lab | 10CP407 | Electronic Circuits and Design Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-III Lab | 10CP408 | Digital Electronics Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **1** | **6** | **570** | **230** | **800** | **23** |

**FIFTH SEMESTER**

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PC-VII | 10PC501 | Analog Communication Systems | 4 | 1 | - | 75 | 25 | 100 | 4 |
| 2 | PC-VIII | 10PC502 | Analog Integrated Circuits | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | PC-IX | 10PC503 | Microprocessors and Micro Controllers | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | PC-X | 10PC504 | Digital Signal Processing | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PE-I | 10PE505 | Professional Elective – I | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | PE-II | 10PE506 | Professional Elective - II | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | PC-IV Lab | 10CP507 | Communication Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-V Lab | 10CP508 | Microprocessors and Micro Controllers Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 9 | PE-I Lab | 10EP509 | Professional Elective Lab - I | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **1** | **9** | **630** | **270** | **900** | **25** |

**SIXTH SEMESTER**

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PC-XI | 10PC601 | Digital Communication Systems | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | PC-XII | 10PC602 | Antenna and Wave Propagation | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | PE-III | 10PE603 | Professional Elective - III | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | PE-IV | 10PE604 | Professional Elective - IV | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PE-V | 10PE605 | Professional Elective - V | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | OE-I | XXOE606 | Open Elective – I | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | PC-VI Lab | 10CP607 | Digital Communication Systems Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-VII Lab | 10CP608 | Signal Processing Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 9 | PE-II Lab | 10EP609 | Professional Elective Lab - II | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **-** | **9** | **630** | **270** | **900** | **24** |

**SEVENTH SEMESTER**

| Sl. No. | Category | Course Code | Course | L | T | P | S | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | HS-IV | 00HS701 | Engineering Ethics | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 2 | PC-XII | 10PC702 | Microwave Engineering | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 3 | PE-V | 10PE703 | Professional Elective - VI | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 4 | PE-V | 10PE704 | Professional Elective - VII | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 5 | OE-I | XXOE705 | Open Elective – II | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 6 | PC-VII Lab | 10CP706 | Microwave Lab | - | - | 3 | - | 60 | 40 | 100 | 2 |
| 7 | PE-III Lab | 10EP707 | Professional Elective Lab – III | - | - | 3 | - | 60 | 40 | 100 | 2 |
| 8 | S & IT | 10ST708 | Seminar / Industrial Training | - | - | - | 1 | 60 | 40 | 100 | 1 |
| | | | **Total** | **20** | **-** | **6** | **1** | **555** | **245** | **900** | **20** |

**EIGHTH SEMESTER**

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | OE - III | XXOE801 | Open Elective - III | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | OE - IV | XXOE802 | Open Elective - IV | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | Project | 10PV803 | Project work and Viva voce | - | - | 15 | 60 | 40 | 100 | 14 |
| | | | **Total** | **8** | | **15** | **210** | **90** | **300** | **20** |

**L –** Lecture**;** **T –** Tutorial**;** **P –** Practical**;** **D –** Drawing

**Exam –** End Semester Examination**;** **CA –** Continuous Assessment.

| Code | Details | Code | Details |
|---|---|---|---|
| 00 | Common Course for the Faculty | 06 | Electronics & Instrumentation Engg. Course |
| 01 | Civil Engg. Course | 07 | Chemical Engg. Course |
| 02 | Civil & Structural Engg. Course | 08 | Computer Science and Engg. Course |
| 03 | Mechanical Engg. Course | 09 | Information Technology Course |
| 04 | Mechanical (Manufacturing) Engg. Course | 10 | Electronics and Communication Engg. Course |
| 05 | Electrical & Electronics Engg. Course | XX | Code of the programme concerned (01 to 10) |

**ES – ENGINEERING SCIENCE**

1) Basic Electronics Engineering

2) Engineering Mechanics
3) Solid Mechanics
4) Construction Engineering Materials
5) Construction Engineering
6) Thermodynamics
7) Material Science
8) Fluid Mechanics and Hydraulic Machinery
9) Particle Mechanics and Mechanical Operations
10) Material Technology
11) Basic Electrical Engineering
12) Computer Programming Lab
13) Engineering Workshop
14) Engineering Graphics
15) Building Drawing Lab
16) Computer Practical – I (Building Drawing)
17) Machine Drawing
18) Electrical and Electronics Lab
19) Hydraulics Lab
20) Particle Mechanics and Mechanical Operations Laboratory
21) Basic Electronics Engineering Lab

**PE – PROFESSIONAL ELECTIVES**

1) Data Structures and C++
2) Java Programming
3) Control Systems
4) Digital Image Processing
5) VLSI Design
6) Fiber Optic Communication
7) Radar and Navigational Aids
8) Satellite Communication
9) Wireless Communication
10) Information Theory and Coding
11) DSP Processor Architecture and Programming
12) Mobile Adhoc Networks

13) Modern Communication Systems
14) Telecommunication Switching and Networks
15) Wavelets and Applications
16) Data Communication
17) Multimedia Compression Technology
18) Embedded Systems
19) Biomedical Signal Processing
20) Electronic Measurements and Instrumentations

**PE - LAB – PROFESSIONAL ELECTIVE LAB**

1) Data Structures and C++ Lab
2) Java Programming Lab
3) Data Communication and Networks Lab
4) VLSI Lab
5) Wireless Communication Lab
6) Networks and Lines Lab
7) Analog Integrated circuits Lab
8) Image Processing Lab

**OE – OPEN ELECTIVES**

1) Soft Computing Techniques
2) Quantitative Management Techniques
3) Network and Information Security
4) Cloud Computing
5) Biology for Engineers
6) Disaster Management
7) Entrepreneurship
8) National Service Scheme
9) Human Rights

**SYLLABUS**
**FIRST SEMSTER**

| 00HS101 | TECHNICAL ENGLISH | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- English technical communication focuses on developing the proficiency of Engineering students in communicative skills, ensuring them to face the demand of their profession with high command in English.
- At the end of the course, the learners will be able to use English for all purposes of technical communication and come out in "flying colours".

**Unit–I : Listening Strategies**

This UNIT makes the students to get exposed to the listening exercises and get registered in their minds the nuances of listening and its importance.

1) Listening process.
2) Types of listening.
3) Barriers to listening.
4) Characteristics of good listeners.
5) Team listening and note making.

**Unit–II : Critical Reading and Creative Writing Skills**

This UNIT introduces communication model like courtesy, body language, role play and good presentation in an effective manner, where the students are given an opportunity to observe, analyze, interpret, imagine and implement their ideas too.

Poem : Road not taken – Robert Frost.

Ulysses – Alfred Lord Tennyson.

Prose : Of Studies – Francis Bacon.

Science – Destroyer or creator – J. Bronowski.

Play : Pygmalion – Bernardshaw.

**Unit–III : Speaking Skill**

Students shall be motivated to speak in English on familiar or unfamiliar topics. It is a platform to train the students to achieve competency in oral expression.

1) Interview Techniques.
2) Group discussion.
3) Making presentation and Discussing on the presentation.
4) Sample interviews.
5) Dialogue writing.

**Unit–IV : Professional Writing**

Students shall be trained to create their own proficiency in writing like - calling for quotation, asking clarification, placing orders and so on.

1) Poster making.
2) Letter writing (formal and E-mail).
3) Analytical writing.

4) Format of memos.
5) Report Writing.

**Unit–V : Theoretical writing**

The nuances of English grammar may be taught to the students so as to present flawless English both in their oral and written communication.

1) Vocabulary – Homonyms, Homophones, Acronyms & Abbreviations, Idioms & Phrases.
2) Single word substitution.
3) Concord.
4) Tag Questions.
5) Active voice and passive voice.

**TEXT BOOKS**

1) Rizvi, Ashraf.2006. *"Effective Technical Communication"*. New Delhi. Tata McGraw Hill Publication Company Ltd.

**REFERENCE BOOKS**

1) Raman, Meenakshi and Sangeetha Sharma.2004. *"Technical Communication: Principles and Practice"*. New Delhi: OUP.
2) Bailey, Stephen. "Academic Writing: A Practical Guide for Students". New York: Rutledge. 2011.
3) Gerson, Sharon J and Steven M. Gerson. 2007. "*Technical Writing: Process and Product*". Delhi: Pearson prentice Hallan, 1980.

**COURSE OUTCOMES**

1) Understand the role of speaking in English and its contribution to their success.
2) Help the students increase the lingual power and word power, and frame suitable structures to use appropriately in different contexts.
3) Initiate the students to adopt different strategies for personal and professional writing.
4) Train the students use diversified rhetorical functions of technical English.

| 00BS102 | ENGINEERING MATHEMATICS – I | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

To acquaint the student with the concepts in

- Matrices.
- differential calculus.
- multiple integrals.
- vector calculus, which are most important in connection with practical engineering problems.

**Unit–I : Matrices**

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem – Orthogonal transformation of a real symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

**Unit–II : Differential Calculus**

Curvature in Cartesian and parametric co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes.

**Unit–III : Differential Calculus: Functions of Several Variables**

Jacobians – Taylor's and Maclaurin's series expansions of functions of two variables – Maxima and Minima of functions of two variables – Constrained Maxima and Minima by Lagrange Method.

**Unit–IV : Multiple Integrals**

Double integration – Cartesian and polar co-ordinates – change of order of integration – area as a double integral – triple integration – Volume as a triple integral.

**Unit–V : Laplace Transform**

Definition, Transform of elementary functions, Properties, Derivatives and integrals of transforms, Transforms of derivatives, Convolution theorem, Transforms of periodic functions,Inverse Laplace transform, Application to solution of linear ordinary differential equations of second order with constant coefficients.

(In all UNITs, proof of theorems are not included).

**TEXT BOOKS**

1) Venkataraman M K, Engineering Mathematics, Volumes I (2008) and II (2009), The National Publishing Company, Chennai.
2) Veerarajan T, Engineering Mathematics, Second Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2011.

**REFERENCE BOOKS**

1) Grewal B S, Higher Engineering Mathematics, Khanna Publishers, Delhi, 40th Edition, 2007.
2) Erwin Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 8th Edition, 2002.

**COURSE OUTCOMES**

1) This course equips students to have knowledge and understanding in matrices, differential calculus, multiple integrals and Laplace transforms.
2) Students will be able to solve problems related to above fields in engineering applications.

| 00BS103 | APPLIED PHYSICS – I | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

At the end of the course the students would be exposed to fundamental knowledge in various engineering subjects and applications

- Determine the different modulus of elasticity and viscosity of the less and highly viscous liquids.
- Design of acoustically good buildings.
- Interferometric techniques in metrology, communication and civil engineering.
- Application of quantum physics to optical and electrical phenomena.
- Application of ultrasonics and acoustics.
- Structure identification of engineering materials.
- Applications of Radio isotopes and power reactor systems.

**Unit–I : Properties of Matter**

Introduction to elasticity - Hook's law - Different modulii of elasticity - Bending of beams – Determination of Young's modulus by Uniform and Nonuniform bending – I-shapegirder – Torsional pendulum - Theory – Experiment and its applications. Introduction to Viscosity – streamline and turbulent flow – Poiseuille's equation-capillary flow method – Stoke's law – terminal velocity – determination of viscosity by Stoke's method.

**Unit–II : Sound**

Introduction to Acoustics - factors affecting acoustics of buildings and their remedies– absorption coefficient– Sabine's formula for reverberation time.

Introduction to Ultrasonics – production – magnetostriction and piezo electric methods – Detection of Ultrasonic waves (Acoustics grating) – Applications.

**Unit–III : Optics**

Interference – Air wedge – Michelson's interferometer – Diffraction - Dispersive power of prism and grating – Polarisation – Types of Polarisation - theory of plane, Circularly and elliptically polarized light – photo elasticity -Stress optic law – Effect of a stressed model in plane polariscope – Isoclinic and Isochromatic fringes – photo elastic bench – uses.

**Unit–IV : Crystal Physics**

Lattice - UNIT–cell - Bravais lattice - Atomic radius, co-ordination number, Packing factor and their calculations of SC,BCC,FCC and HCP crystal structures - Miller indices - Crystal imperfections (Point defect, Line defect, surface defect and volume defect).

**Unit–V : Nuclear Physics**

Introduction - General properties of Nucleus – Mass defect, Binding energy, Nuclear models – Liquid drop model and Nuclear shell model - Nuclear detector – G.M counter – Scintillation Counter – Ionisation Chamber – Fission, Fusion,

Thermonuclear reaction and Stellar energy – Nuclear reactor – General nuclear reactor – Breeder nuclear reactor.

**TEXT BOOKS**

1) Arumugam M., "Engineering Phyisics", Anuradha Agencies, Kumbakonam, 2000.
2) Gaur R.K. and Gupta S.L., "Engineering Physics", DhanpatRai Publishers, New Delhi, 2003.

**REFERENCE BOOKS**

1) Pillai S.O., "Solid State Physics", New Age International Publication, New Delhi, Seventh Edition, 2015
2) Palanisamy P.K. "Physics for Engineers", Scitech Publication (India) Pvt. Ltd., Chennai, Second Edition, 2005.
3) Mani. P. "Engineering Phyisics", Dhanam Publication, Chennai, 2011.
4) Rajendran V. and Marikani A., "Applied physics for engineers", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.
5) Theraja B.L, "Modern Physics", Chand & company Ltd. , Edition 1990.
6) Tayal D.G., "Nuclear Physics", Himalaya publishing house, 2007.
7) Ghoshal.S.N., "Nuclear Physics", S. Chand & Company Ltd., 2012.
8) Avadhanulu M.N. and Kshirsagar P.G., "A Text Book of Engineering Physics", S. Chand & Company Ltd., 7th Enlarged Revised Ed., 2005.

**COURSE OUTCOMES**

1) The Engineering students can gain the basic knowledge in the field of optics, sound, nuclear physics and crystalline materials etc.
2) It will be useful to apply in engineering applications.

| 00BS104 | APPLIED CHEMISTRY – I | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

To make the student conversant with the

- Water treatment techniques and disinfection methods.
- Working principle of electrochemical cells.
- Sources, refining and various types of fuels.
- Mechanism, classification, applications of lubricants and introduction adhesives.
- Surface chemistry, principle and applications of chromatography.

**Unit–I : Water Treatment**

Water – Hardness of water – softening of water by ion-exchange process and zeolite process – boiler feed water – specifications – boiler troubles (Sludge and scale formation, priming and foaming, caustic embrittlement and boiler corrosion) – removal of dissolved $CO_2$, $O_2$ and acids – internal treatment of boiler feed water (colloidal, carbonate, phosphate, calgon and EDTA conditioning) – disinfection of

water – break point chlorination – desalination of brackish water by reverse osmosis method - Determination of total hardness by EDTA method.

**Unit–II : Electrochemistrty**

Electrochemical cell – EMF – determination of EMF of electrochemical cell – single electrode potential – standard electrode potential – Nernst equation – reference electrodes – standard hydrogen electrode, calomel electrode, glass electrode – electrochemical series – concentration cell.

**Unit–III : Fuels and Combustion**

Classification of fuels – calorific value – HCV and LCV – Analysis of coal – proximate and ultimate analysis – carbonization of coal (HTC and LTC) – Manufacture of coke – properties of coke – flue gas analysis by Orsat's apparatus. Petroleum – Refining – Synthetic petrol – Fischer – Tropsch and Bergius process – cracking – polymerization process – knocking in petrol and diesel engines – octane number and cetane number – properties of straight run, cracked and polymer gasoline.

**Unit–IV : Engineering Materials – I**

Lubricants and their functions – Mechanisms of lubrication – classification of lubricants with example – lubricating oils – properties of lubricating oils (viscosity index, flash and fire points, cloud and pour points, oiliness, carbon residue and aniline point) – Solid lubricants – Greases – emulsion lubricants. Adhesives – Definition – adhesive action – development of adhesives strength – physical and chemical factors influencing adhesive action – bonding process of adhesives – adhesives for building and constructions – animal glues, casein glues.

**Unit–V : Analytical Technique and Surface Chemsitry**

Chromatography – Definition – classifications – partition chromatography and adsorption chromatography.

Surfacechemistry – Definition – types of adsorption – characteristics of adsorption – adsorption isotherms – Freundlich's adsorption isotherms and Langmuir's adsorption isotherms – applications of adsorption.

**TEXT BOOKS**

1) Sivasankar. B (2012)., 'Engineering Chemistry', Tata McGraw Hill Publishing company Limited, NewDelhi.

2) Sivakumar. R and Sivakumar. N (2013)., 'Engineering Chemistry', Tata McGraw-Hill Company Limited, NewDelhi

**REFERENCE BOOKS**

1) Jain. P.C. and Monica Jain (2010)., 'Engineering Chemistry', DhanpatRai & Sons, New Delhi.

2) Dara. S.S. and Umare. S.S (2014)., 'Text Book of Engineering Chemistry,' S.Chand& Co. Ltd., New Delhi.

3) Gopalan. R, Venkappayya. D, and Nagarajan. S (2008)., 'Engineering Chemistry', Tata McGraw Hill Publishing Company Limited, New Delhi.

**COURSE OUTCOMES**

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

1) Understand and develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
2) Understand and apply the concepts of electrochemistry including electroplating.
3) Understand the properties, sources of fuel and the concept of combustion
4) Gain the knowledge about types of lubricants, uses & their mechanisms and to understand the binding process of adhesives, and its application in building and construction.
5) Separate and purify various organic and inorganic compounds using different chromatographic techniques.
6) Understand the concept of surface chemistry and its applications.

| 00SP105 | COMPUTER PROGRAMMING LABORATORY | L | T | P |
|---|---|---|---|---|
| | | 0 | 1 | 3 |

**COURSE OBJECTIVES**

- To enable the students to have a good understanding about the concepts of "C" programming.
- To provide the hands on experience in basic concepts of AUTOCAD to students.

**C Programs based on the following concepts**

Basic structure of C Programs – Constants – Variables - Data Types - – Keywords – Identifiers - Operators - Expressions – IF, IF-ELSE, Nested IF-ELSE, Switch, WHILE, DO, FOR and GOTO statements - Arrays: one dimensional and two dimensional – Strings - Functions.

**AUTOCAD**

Introduction – Terminology – Coordinates - Operations – Control keys – Commands – Utility Commands –File Commands – Edit and Inquiry Commands – Display Control Commands – Modes – Layers – Colors – Blocks.

Special Features – Dimensioning – Angular, Diameter and Radius – Hatching – Patterns – Slides – Attributes – Configuring – Plotting– Exercises in AUTOCAD (2D Drawings only)

**TEXT BOOKS**

1) E. Balagurusamy, Programming in Ansi C, Tata McGraw-Hill Education, (2012) 6th Edition.
2) Cheryl R. Shrock, AutoCAD Pocket Reference, BPB Publications,(2015)

**REFERENCE BOOKS**

1) Yashavant P. Kanetkar, Let us C, BPB Publications, 14th Edition, (2016)
2) David Byrnes, AutoCAD 2010 FOR DUMMIES, Wiley Publishing,Inc., (2010)

**COURSE OUTCOMES**

1) Understand the concepts of C programming.
2) Apply the syntax of conditional and looping statements for writing C programs
3) Use the features of AUTOCAD for 2D drawing

| 00SP106 | ENGINEERING WORKSHOP | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To provide the students simple hands-on-experience in the basic aspects of production engineering in fitting, carpentry and sheet metal.

**Workshop Practice in the Shops**

Carpentry: Use of hand tools – exercises in planning and making joints namely, half lap joint, dovetail joint, mortising and tenoning.

Fitting: Use of bench tools, vice, hammers, chisels, files, hacksaw, centre punch, twist drill, taps and dies – Simple exercises in making T joint and dovetail joints.

Sheet Metal Work: Use of hand tools – Simple exercises in making objects like cone, funnel, tray, cylinder.

Smithy: Demonstration of hand forging and drop forging.

**COURSE OUTCOMES**

This course

1) Use basic tools of fitting, carpentry and sheet metal fabrication.
2) Experience in the fabrication of simple carpentry joints.
3) Develop skill to make simple fitting joints.
4) Train to make simple shapes of sheet material.
5) Distinguish hand forging and drop forging operation.

**SECOND SEMESTER**

| 00BS201 | ENGINEERING MATHEMATICS II | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To acquaint the student with the concepts in ordinary differential equations and vector calculus.
- To acquaint the student with the techniques in the theory of analytic functions and complex integration.
- Above topics are most important in connection with practical engineering problems.

**Unit–I : Ordinary Differential Equations**

Second order linear differential equations with constant coefficients, Second order linear differential equations with variable coefficients (Euler and Legendre's linear equations), Simultaneous first order linear equations with constant coefficients, method of variation of parameters.

**Unit–II : Vector Differentiation**

Gradient, divergence and curl, directional derivative, UNIT–normal vector, irrotational and solenoidal vector fields, expansion formulae for operators involving $\nabla$.

**Unit–III : Vector Integration**

Line, surface and volume integrals, Green's theorem in a plane, Gauss divergence theorem, Stoke's theorem – Verification of the above theorems and evaluation of integrals using them.

**Unit–IV : Analytic Functions**

Functions of a complex variable, Analytic function, the necessary conditions (Cauchy-Riemann equations), sufficient conditions, Properties of analytic functions, harmonic functions, construction of Analytic function by Milne-Thomson method, Conformal mapping: $w = z^2$, $1/z$, $e^z$, sin z, cos z.

**Unit–V : Complex Integration**

Statement and application of Cauchy theorem, Cauchy integral formulas, Taylor and Laurent expansion, Singularities – Classification; Residues – Statement and application of Cauchy residue theorem, Contour integration round the UNIT–circle.

(In all UNITs, proof of theorems are not included).

**TEXT BOOKS**

1. Venkataraman M.K., Engineering Mathematics, Volumes I (2008) and II (2009), The National Publishing Company, Chennai.
2. Veerarajan T, Engineering Mathematics, Second Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2011.

**REFERENCE BOOKS**

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi, 40th Edition, 2007.
2. Erwin Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 8th Edition, 2002.

**COURSE OUTCOMES**

1. This course equips students to have knowledge and understanding in ordinary differential equations, vector calculus and complex variables.
2. Students will be able to solve problems related to above fields in engineering applications.

| 00BS202 | APPLIED PHYSICS – II | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

At the end of the course the students would be exposed to fundamental knowledge in various materials and applications.

- Application of lasers and fiber optics in engineering and technology.
- Astrophysics is the study of physics of the universe. In various objects, such as stars, planets and galaxies.
- To measure positions, brightness, spectra structure of gas clouds, planets, starts, galaxies, globular clusters, quasars etc.
- Physics of modern engineering materials.
- Electromagnetic phenomena and wave propagation.
- Applications of nano materials, nano electronics and optoelectronic devices.
- Design of energy sources and applications of solar energy.

**Unit–I : Laser and Fiber Optics**

Introduction to laser - Einstein co-efficients (A&B) – properties of Laser- Types of laser – $CO_2$, Nd-YAG and Semiconductor lasers - Applications – Holography - Construction and reconstruction of hologram - Applications.

Fiber optics - Principle and propagation of light in optical fibers - Numerical aperture and acceptance angle - Types of optical fibers (Material, Mode and refractive index) - Applications - Fiber Optic communication system.

**Unit–II : Dielectrics and Superconductors**

Introduction to Dielectrics – Types of Dielectric materials - Dielectric constant – Determination of Dielectric constant ($\sum r$) by Schering Bridge method – Different types of polarization – Local or Internal field – Clausius-Mosotti Equation – Dielectric Loss – Dielectric breakdown – Dielectric Properties and applications – Superconductivity – Properties – Meissner effect – Type I and Type II superconductors – BCS theory- High temperature Superconductors – Applications.

**Unit–III : Nano Materials**

Introduction to Nanomaterials – properties – Types of nanomaterials – synthesis of nanomaterials - Top-down approaches – Mechanical grinding, Lithiography – Types of Lithiography - Bottomup approaches – physical vapour deposition method, Sol-gel method. Applications of nanomaterial. Carbon Nanotubes (CNT) – Introduction – Types of Carbon Nanotubes – Synthesis of Carbon Nanotubes – Properties and its application.

**Unit–IV : Quantum Mechanics**

Heisenberg uncertainty Principle - Wave particle dual nature – De Broglie's matter Waves – wave Velocity and group velocity.

The wave Equation, Schrödinger's Time dependent wave equation, Schrödinger's time independent wave equation - The Wave function and its physical significance - The particle in a box – energy quantization – Eigen values and Eigen functions.

**Unit–V : Energy Physics**

Introduction to energy source - Energy sources and their availability (Conventional &non-conventional energy sources) – Solar energy – Introduction – Methods of Harvesting Solar energy (Solar cells, Solar battery, Solar heat collectors and Solar water heater) - Wind energy – basic components of a WECS (Wind Energy Conversion System) – Classification of WEC Systems – Advantages and disadvantages of WECS - Biomass – Biomass conversion - Biogas Generation - Classification of Biogas plants.

**TEXT BOOKS**

1) Arumugam. M. "Engineering Physics", Anuradha Agencies, 2nd Edition, 1997.
2) Gaur R.K. and Gupta S.L., "Engineering Physics", DhanpatRai Publishers, New Delhi, 2003.

**REFERENCE BOOKS**

1) Rajendran. V, "Engineering Physics", Tata McGraw Hill Publishers, 2009.
2) Rai G.D., "Non-conventional Energy sources", Khauna Publications, 1993.
3) Martin Harwit, "Astrophysical Concepts", Springer, 4th Edition, 2006.
4) Dimitri Mihalas. "Stellar Atmospheres", San Francisco, W.H, Freeman & Company, 1978.

5) Wilson M., Kannangara K., Smitt G., Simmons M. & Boguse B. "Nanotechnology", Basic science and emergine technology, Raguse Chapman hall Publications, 2002.
6) Kenneth Klabunde. J, "Nanoscale Materials in chemistry", A John Eiley & Sons, Inc., Publication, 2001.
7) Mani. P. "Engineering Phyisics", Dhanam Publication, Chennai, 2011.
8) Agarwal. M.P, "Solar Energy", S. Chand & Co., I Edn, New Delhi, 1983.
9) John Twidell & Tony Weir, "Renewable Energy Resources", Taylor & Francis, 2005.
10) Carroll B.W. & D.A. Ostlie, "An introduction to Modern Astrophysics", 2nd Edition, 2011.
11) Avadhanulu M.N. and Kshirsagar P.G., "A Text Book of Engineering Physics", S. Chand & Company Ltd., 7th Enlarged Revised Ed., 2005.
12) Rai. G.D., *"Solar Energy* Utilization" Volume-1 & 2 by - Khanna Publishers, New Delhi.
13) Senthilkumar. G, Engineering Physics, VRB Publishers Pvt. Ltd., Chennai.
14) Ravikrishnan. A, Environmental Science and Engineering, Hitech Publishing Company Pvt. Ltd,.
15) Rai. G.D., *"Non-Conventional Energy Sources"* - Khanna Publishers.
16) Senthilnathan, S., Gnanapoongothai. T, Oudayakumar. K, Jayavarthanan. T, "Material Science", SSMP Publications.

**COURSE OUTCOMES**

1) The student will have the theoretical knowledge in this field of laser, dielectrics, Nano technique, energy physics etc.
2) It will be very useful to the students to apply in different field of engineering.

| 00BS203 | APPLIED CHEMISTRY - II | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

To make the students to understand the

- Types of polymers and polymerization processes.
- Phase rule with different kinds of systems.
- Different types of corrosion and their mechanism.
- Working principle and applications of primary and secondary batteries.
- Engineering materials such as refractories and abrasives.

**Unit–I : Polymers**

High polymers: plastics – Thermoplastics and thermosetting resins. Addition polymerization and condensation polymerization – compounding of plastics – Moulding methods – Compression, injection and blow moulding – Important engineering plastics – polyethylene, PVC, Teflon, Polystyrenes, Nylon 6,6, Bakelite, Polyurethane – Rubber – natural rubber – vulcanization of rubber – Synthetic rubber – buna-S, butyl rubber, neoprene and polyurethane foams.

**Unit–II : Phase Rule**

Phase rule – statements and explanation of the terms involved – condensed phase rule – construction of phase diagram – water system – sulphur system – phase rule for two component alloy systems – thermal analysis – eutectic system – Lead-Silver system – simple eutectic formation – Zinc – Magnesium alloy system.

**Unit–III : Corrosion and Prevention**

Corrosion: Dry and wet corrosion – Pilling-Bedworth rule – mechanism of wet corrosion – types of wet corrosion – galvanic corrosion – differential aeration corrosion – factors affecting corrosions. Corrosion control methods – design and material selection – cathodic protections – sacrificial anode and impressed current method – corrosion inhibitors – protective coatings – surface preparations – Galvanizations, Tinning – electroplating – anodizing, phosphate coating, hot dipping.

**Unit–IV : Energy Storage Devices**

Types of battery – commercial voltaic cell – primary battery – secondary storage cell – lead – acid cell, nickel-cadmium cell, lithium battery – fuel cells – hydrogen-oxygen fuel cell – photovoltaic cell – principle, working and applications.

**Unit–V : Engineering Materials II**

Refractories – classification (acidic, basic and neutral refractories) – properties (refractoriness, refractoriness under load, dimentional stability, porosity, thermal spalling) – fire clay bricks, alumina bricks and zirconia bricks. Abrasives – Moh's scale of hardness – natural abrasive (diamond, corundum, emery, garnets and quartz) – synthetic abrasives – silicon carbide, boron carbide and their uses.

**TEXT BOOKS**

1) Sivasankar. B., (2012). 'Engineering Chemistry', Tata McGraw Hill Publishing Company Limited, New Delhi.
2) Sivakumar. R. and Sivakumar. N. (2013). 'Engineering Chemistry', Tata McGraw Hill Company Limited, New Delhi.

**REFERENCE BOOKS**

1) Jain. P.C. and Monica Jain (2010). 'Engineering Chemistry', DhanpatRai & Sons, New Delhi.
2) Dara. S.S. and Umare. S.S., (2014). 'Text book of Engineering Chemistry', S. Chand & Co. Ltd., New Delhi.
3) Gopalan. R, Venkappayya. D, and Nagarajan. S (2008). 'Engineering Chemistry', Tata McGraw Hill Publishing Company Limited, New Delhi.
4) Gowariker.V.R.,Viswanathan N.V. and Jayadev Sreedhar, (2006). 'Polymer Science', New Age International P (Ltd.,), Chennai. (UNIT–I).
5) Puri. B.R., Sharma. L.R. & Pathania. M.S., (2013). 'Principles of Physical Chemistry', Vishal Publishing Company, NewDelhi. (UNIT–II).

**COURSE OUTCOMES**

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

1) Understand the synthesis and applications of various types of polymers and moulding processes.
2) Understand the concept of phase rule and its applications, which is applicable in alloy preparation.

3) Understand the concept of corrosion and to apply the knowledge in the protection of different metals from corrosion.
4) Gain the knowledge about various energy storage devices, especially solar energy.
5) Have the knowledge of converting solar energy into most needy electrical energy efficiently and economically to reduce the environmental pollution.
6) Gain knowledge on classification, synthesis and applications of abrasives and refractories.

| 00ES204 | BASIC ENGINEERING (CIVIL) | L | T | P |
|---|---|---|---|---|
| | | 2 | 0 | 0 |

**COURSE OBJECTIVES**

- To inculcate a knowledge on essentials of Civil Engineering
- To expose the students on the role, significance and contributions of Civil Engineering in satisfying societal needs
- To illustrate the concepts of various construction techniques

**Unit–I**

Introduction to Civil Engineering - various disciplines of Civil Engineering, relevance of Civil Engineering in the overall infrastructural development of the country. Introduction to various building materials – Stone, Bricks, Steel, Cement, Concrete, Timber – its characteristics, types and uses. Various types of buildings as per nbc; Selection of suitable site for buildings, Components of a residential building – its functions, Orientation of a building, simple definitions - plinth area / built up area, floor area / carpet area – floor space index.

**Unit–II**

Surveying - Principles and objectives of surveying; Types, Classifications of surveying, measurement of areas and distances – chain – compass: Introduction to Leveling, Total station, Remote sensing - fundamental principles and applications.

Building construction – foundations; Bearing capacity of soil, functions of foundations, Types - Shallow and Deep. Brick masonry – Header, Stretcher, Flemish and English Bond. Columns, Lintels, Roofs – functions, types, roofing materials, Floors – functions, types, flooring materials. Decorative finishes – plastering, interior design

**Unit–III**

Bridges – necessity - selection of site – components of a bridge: Dams – types – selection site - forces acting on a dam – Roads – uses - classification of roads – components of a road; Railways – basic components of permanent way – water supply – per capita requirement – sources – need for conservation of water – rain water harvesting - basic water treatment – Sewage and its disposal – basic definitions – Septic tank - components and functions.

**TEXT BOOKS**

1) Ramesh Babu, V., A text Book of Basic Civil Engineering, Anuradha Agencies, Kumbakonam, 1995.
2) Palanichamy, M.S., Basic Civil Engineering, Tata McGraw Hill Publishing Company ltd, 2000.

**REFERENCE BOOKS**

1) Ramamrutham, V., Basic Civil Engineering, DhanpatRai Publishing Co. (P) Ltd., 1999.
2) Natarajan, K.V., Basic Civil Engineering, Dhanalakshmi Publications, Chennai, 2005.
3) Satheesh Gopi, Basic Civil Engineering, Pearson Publications, 2010.

**COURSE OUTCOMES**

1) Understand the basic knowledge on civil engineering materials.
2) Develops the skill to satisfy the social needs.
3) Describe the suitable method of construction technique.

| 00ES204 | BASIC ENGINEERING (ELECTRICAL) | L | T | P |
|---|---|---|---|---|
| | | 2 | 0 | 0 |

**COURSE OBJECTIVES**

- To impart the basic principles of generation of electrical energy.
- To explain the operation of electrical machines and various measuring instruments.
- To understand the basic concepts of circuit analysis.
- To provide an overview of the principles, operation and application of semiconductor devices like diodes, BJT, FET and a basic knowledge of fundamentals of Communication Systems.

**Unit–I**

Sources of Electrical energy–Generation of electrical energy – working principles of DC generators and alternators– Advantages of electrical energy over other forms of Energy.

Operating principle of DC motors– Types of DC motors– Characteristics and uses of DC motors. Working principles of Single and Three phase transformers. Operating Principle of three phase and single phase induction motors– types and uses of induction motors.

Working principles of MC and MI voltmeters and Ammeters, Dynamo meter type wattmeter, Induction type energy meter and Multimeter–types of wiring– requirements for house wiring–typical layout for a small house– earthing.

**Unit–II**

DC Circuits: Definition of current, voltage, power and energy– DC voltage and current sources– resistance, types of resistors, series and parallel connections of resistors, current and voltage division–loop method of analysis of simple circuits.

AC Circuits: Sinusoidal signals – average, r.m.s values –inductance, capacitance and their V–I relationships. Analysis of simple single phase series circuits– power and power factor–phasor diagrams– Introductions to three phase AC circuits.

**Unit–III**

Basic Electronics: Principle and characteristics, uses of PN junction Diode, Zenerdiode, BJT, FET, UJT, Thyristors,- Operating principle of Half wave, Full wave and Bridge rectifiers.

Digital Electronics and Principles of Communication Systems: Symbol, truth table and functions of basic logic gates, universal gates, Half adder, Full adder. Communication systems–Microwave, Satellite, Fibreoptic and ISDN (block diagram description only).

**TEXT BOOKS**

Nagrath, I.J., 2007. Elements of Electrical Engineering, 2nd Edition, 14th reprint, Tata McGraw Hill Publishing Co. Limited, New Delhi.

**REFERENCE BOOKS**

1) Gupta, B.R., 2002. Principles of Electrical Engineering, S. Chand &Co, New Delhi.
2) Theraja. B.L & Theraja. A.K., 2000. Electrical Technology, Vol. I, II, and IV, S. Chand and Co., New Delhi.
3) Floyd & Jain, 2009. Digital Fundamentals, 8th Edition, Person Education.
4) Anok Singh, 2006. Principles of Communication Engineering, 6th Reprint, S. Chand & Company Ltd., Ram Nagar, New Delhi.

**COURSE OUTCOMES**

After the completion of the course, the student should be able to

1) Provide comprehensive idea about simple circuit analysis, working principles of machines and common measuring instruments.
2) Analyze the behavior of any dc and ac circuits.
3) Characterize semiconductor devices that include diodes, BJT and digital functions.
4) Understand fundamental principles of communication systems.

| 00ES204 | BASIC ENGINEERING (MECHANICAL) | L | T | P |
|---|---|---|---|---|
| | | 2 | 0 | 0 |

**COURSE OBJECTIVES**

- To familiarize the students the functioning of different types of Boilers, the mountings and accessories.
- To provide basic knowledge about the use of various machine tools and the basic principles of welding, brazing and soldering.
- To illustrate the concepts of various metal forming operations and metal joining techniques.

**Unit–I**

Boilers: Classification – Description and working of Simple vertical boiler, Cochran boiler, Babcock and Wilcox boiler - Description and working of boiler mountings: water level indicator, Pressure gauge, Dead weight and Spring loaded Safety value, Fusible plug, Feed check value, Steam stop value and Blow–off cock - Description and working of boiler accessories: Economiser and Super heater.

**Unit–II**

Prime Movers: Steam turbines: Principles and working of Impulse and Reaction turbines – Comparison. Gas turbines: Principles and working of Open cycle and Closed cycle gas turbines. Internal Combustion Engines: Classification – principal

parts – comparison of two strike and four stroke engines – working principle of petrol and diesel engines.

**Unit–III**

Machine Tools: Description of parts and operations performed – Lathe, Shaper and Drilling machine.

Metal Forming: Hot working versus cold working; Hand forging – Principle and operations; Rolling – Principle, rolling mill configurations; Extrusion – Direct versus indirect extrusion.

Metal Joining: Gas welding – principle, Oxy-acetylene welding – equipment, types of flames, advantages and disadvantages – Arc welding - principle, advantages and disadvantages – Brazing – Torch brazing, dip brazing, furnace brazing, resistance brazing – Soldering – Comparison of brazing and soldering.

**TEXT BOOKS**

1) Prabhu, T.J., Jaiganesh ,V. and Jebaraj, S., Basic Mechanical Engineering, Scitech Publications Pvt. Ltd., Chennai, 2000.
2) Venugopal and Prabhuraj, T.J., Basic Mechanical Engineering, ARS Publishers, Sirkali, 1996.

**REFERENCE BOOKS**

1) Hajra Choudhury, S.K., Nirjhar Roy, Hajra Choudhury, A.K., Elements of Workshop Technology, (Vol 1 and Vol II), Media Promoters, Pvt Ltd. (2008).
2) Rao, P.N., Manufacturing Technology: Foundry, Forming and Welding-Vol-1, McGraw Hill Education, (2013).
3) Steven R. Schmid, Serope Kalpakjian, Manufacturing Processes for Engineering Materials, (English) 5th Edition, Pearson India, ( 2009).

**COURSE OUTCOMES**

1) Understand the construction and working principles of boiler operations
2) Distinguish between steam turbines and gas turbines.
3) Select suitable manufacturing methods to produce a new component.

| 00HS205 | COMMUNICATION SKILLS AND LANGUAGE LABORATORY | L | T | P |
|---|---|---|---|---|
| | | 0 | 2 | 3 |

**COURSE OBJECTIVES**

- The Language Lab focuses on the production and practices of sounds of language.
- The Language Lab familiarizes the students with the use of English in everyday situations and contexts.

**Theoretical Session (Internal Assessment only)**

1) English sound pattern
2) Sounds of English
3) Pronunciation
4) Stress and Intonation
5) Situational Dialogues/Role play
6) Oral presentations- Prepared or Extempore

7) 'Just a Minute' sessions (JAM)
8) Describing Objects/situations/people
9) Debate
10) Giving Directions.

**Practical Session**

- To make the students recognize the sounds of English through Audio Visual Aids
- To enable the students speak fluently without fear
- To develop their communicative skill with individual practice through the prescribed package
- The Globarena Package consists of the following exercises
    1. Reading comprehension
    2. Listening comprehension
    3. Vocabulary exercises
    4. Phonetics
    5. Role Play in dialogues
    6. Auto Speak.

**Minimum Requirement**

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language Globarena software for self- study by learners and Library with Books to improve their proficiency in English.

**Suggested Software**

1) Globarena Package for communicative English.
2) Cambridge Advanced Learner's English Dictionary.
3) Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
4) English Pronouncing Dictionary Daniel Jones Current Edition with CD.
5) Spoken English- R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn.
6) A Practical course in English Pronunciation, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
7) A text book of English Phonetics for Indian Students by T. Balasubramanian (Macmillan).
8) English Skills for Technical Students, WBSCTE with British Council, OL.

**DISTRIBUTION AND WEIGHTAGE OF MARKS**

English Language Laboratory Practical Paper:

1) The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2) For the Language lab sessions, there shall be a continuous evaluation during the year for 40 sessional marks and 60 year-end Examination marks. The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

**COURSE OUTCOMES**

1) Help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such as GRE, TOEFL, GMAT, etc.
2) Train the students to use language effectively to face interviews, group discussions, and public speaking.
3) Initiate the students into greater use of the computer in resume preparation, report writing, format-making, etc.

| 00BP206 | APPLIED PHYSICS LABORATORY | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

The ability to offer students a variety of research opportunities

- To determine the radius of curvature of the plano convex lens and the wavelength of the sodium light by measuring the diameter of Newton's rings.
- We can use a spectrometer to measure this angle of deviation.
- To measure the modulus of elastic material by torsional pendulum and bending of a beam.
- To determine the resistivity of a given steel and brass wire.
- To find the velocity of ultrasonic waves in a liquid.
- Less viscosity of the liquid by poiseuille's method.

**List of Experiments (Any Ten)**

1) Non-Uniform Bending - Determination of Young's modulus of the given scale or beam.
2) Newton's rings- Determination of Radius of curvature of the given Plano convex lens.
3) Viscosity –Determination of co-efficient of Viscosity of a highly viscous liquid by Stoke's method.
4) Spectrometer – Dispersive power of a given prism.
5) Torsional Pendulum – Determination of Moment of Inertia of the metallic disc and Rigidity Modulus of the material of a wire.
6) Field along the axis of a coil- Determination of horizontal earth magnetic flux density.
7) Air wedge – Determination of thickness of a given thin wire and paper.
8) Viscosity - Determination of co-efficient of Viscosity of a less viscous liquid by Capillary flow method.
9) Uniform bending- Determination of Young's modulus of the given scale or beam.
10) Spectrometer – Determination of wavelength of the prominent spectral lines using Grating.
11) Semiconductor diode laser – Determination of wavelength of Laser source using Grating.
12) Band gap determination of a Semiconductor.

**COURSE OUTCOMES**

This course

1) To determine resistivity of a given steel and brass wire.
2) To find the velocity of ultrasonic waves in a liquid.
3) To measure the thickness of a thin materials.
4) To determine the band gap of a given semiconductor.
5) Diffraction patterns can be formed by light passing through a series of fine lines.
6) Applications of opto electronic devices.

| 00BP207 | APPLIED CHEMISTRY LABORATORY | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To appreciate the practical significance of acidimetry, alkalimetry and permanganometry.
- To analyse quantitatively the amount of a substance present in a given sample.
- To assess the composition of an alloy.
- To test the water quality standards.

**LIST OF EXPERIMENTS**

1) Estimation of Potassium hydroxide
2) Estimation of Acetic acid in vinegar
3) Estimation of Temporary hardness of water sample
4) Estimation of Total hardness of water sample
5) Estimate separate amount of sodium carbonate and sodium hydroxide in a mixture .
6) Estimation of Ferrous sulphate
7) Estimation of Mohr's salt
8) Estimation of ferrous iron
9) Estimation of Oxalic acid
10) Determination of available free chlorine in a water sample.
11) Estimation of copper in brass by iodometry
12) Estimation of iron by dichrometry
13) Estimation of nickel in an alloy.

**COURSE OUTCOMES**

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

Gain knowledge in the quantitative chemical analysis of water quality related parameters, acid-base, red-ox and iodometry titrations.

| 00SP 208 | ENGINEERING GRAPHICS | L | T | P |
|---|---|---|---|---|
| | | 2 | 0 | 3 |

**COURSE OBJECTIVES**

- To develop the ability to produce simple engineering drawing and sketches based on current practice.
- To develop the means for communication of ideas, thoughts and design of objects, related to engineering applications, to others though drawing.
- To develop the skills to read manufacturing and construction drawings used in industry.
- To develop a working knowledge of the layout of plant and equipment.
- To develop skills in abstracting information from calculation sheets and schematic diagrams to produce working drawings for manufacturers, installers and fabricators.
- To expose the international standards of technical drawing

**Unit–I**

Introduction to Engineering Drawing, Use of drafting instruments– Lettering and dimensioning.

Construction of conic sections -Ellipse, Parabola & Hyperbola (Eccentricity Method, Rectangle method, Intersecting arcs method) - Special curves- Simple cycloids and involutes– Tangent and normal at points on the curves only.

**Unit–II**

Orthographic projections - Projections of Points- Projections of Straight lines (given the projections, to determine the true length and true inclinations).

**Unit–III**

Projections of Solids like prism, pyramid, cylinder, cone, tetrahedron and octahedron in simple positions.

Auxiliary Projections of prism, pyramid, cylinder, cone when the axis is inclined to one plane only.

**Unit–IV**

Sections of prism, pyramid, cylinder, cone in simple position – true shape of sections. Intersection of surfaces - cylinder to cylinder and cylinder to cone with axis intersecting at right angles. Development of lateral surfaces of prism, pyramid, cylinder, cone and cut solids.

**Unit–V**

Isometric Projections of simple solids and combinations. Perspective Projections of simple solids. Conversion of Pictorial view of simple objects into Orthographic views.

**TEXT BOOKS**

1) Bhatt, N.D., Engineering Drawing, Charotar Bookstall, Anand – 388001.
2) Venugopal, K., Engineering Drawing and Graphics – New Age International (P) Ltd., Publishers, Chennai.

**REFERENCE BOOKS**

1) Gopalakrishna, K.R., Engineering Drawing, Vol. I and Vol. II, Subhas Stores, Avenue Road, Bangalore – 560002.
2) Kumar, M.S., Engineering Graphics, DD Publications, Chennai – 6400048.

**COURSE OUTCOMES**

Upon completion of this course, the students will be able to:

1) Construct, read, and understand the Title and Revision Block.
2) Usage of common drafting tools to construct engineering drawings enhances.
3) Apply dimensions on engineering drawing.
4) Ability of converting sketches to engineered drawings will increase.
5) Developing cognitive and psychomotor skills, visualize images and their dimensions.
6) Develop good communication skills and team work.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Vision**

To provide innovative, creative and technically compliant Electronic and Communication Engineers for industry and society through excellence in Technical Education and Research.

**Mission**

- To provide quality education in the field of Electronics and Communication Engineering through periodically updated curriculum, effective teaching-learning process, best laboratory facilities and collaborative ventures with the industries.
- To inculcate innovative skills, research aptitude, team-work, ethical practices among students so as to meet expectations of the industry as well as society.
- To provide students with hands on training on latest technology with supporting software.
- To facilitate effective interactions among faculty and students, and foster networking with alumni, industries and other reputed institutions.

## PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

| S.No. | PEO |
|---|---|
| PEO 1 | To prepare students to excel in undergraduate Programme and to succeed in industry / technical profession through quality education. |
| PEO 2 | To provide students with solid foundation in mathematics, basic science and engineering fundamentals necessary to analyze, formulate and solve problems in the field of Electronics and Communication engineering. |
| PEO 3 | To inculcate a strong flavor of project activities among the students and impart them with good scientific and engineering knowledge including proficiency in hardware languages, use of latest software tools, so as to analyze, design and create novel products and provide solutions to real life problems. |
| PEO 4 | To impart the professional and ethical attitude, effective communication and presentation skills, teamwork skills, multidisciplinary approach, and an ability to integrate engineering issues to broader social contexts to students. |
| PEO 5 | To provide student with an academic environment aware of excellence, outstanding leadership, written ethical codes and guidelines with moral values, and the life-long learning needed for a successful professional career. |

## PROGRAMME OUTCOMES (PO)

After successful completion of B.E. (Electronics and Communication Engineering) degree Programme, the graduates will be able to

| S.No. | PO |
|---|---|
| PO 1 | Apply the knowledge of mathematics, basic science and engineering fundamentals in finding solutions to complex problems in the field of Electronics and Communication Engineering. |
| PO 2 | Analyze a problem, identify and formulate the computing requirements appropriate to its solution. |
| PO 3 | Capable of designing a system, component or process that meets specific needs with appropriate considerations for health, safety, societal and Environmental Issues. |
| PO 4 | Design and Conduct experiments as well as to analyze and interpret data. |
| PO 5 | Use latest simulation tools, current techniques, software and hardware skills for analyzing and obtaining solutions to Engineering Problems. |
| PO 6 | Possess adequate knowledge required for sustainable development, keeping in view of environmental impacts and contemporary issues. |
| PO 7 | Acquire strong ethical and professional responsibilities, adherence to quality and abide rules and regulations of eminent organizations or industries. |
| PO 8 | Competent to articulate their ideas with excellent communication skills and preparation of technical reports and capability of working productively as individuals, team members or leaders in any multidisciplinary environment. |
| PO 9 | Succeed in competitive examinations like Engineering Services, GATE and other Public Service Commission Exams. |
| PO 10 | Engage in self-education and life-long learning. |

### Mapping of PO with PEO

| Mapping of PO with PEO | | | | | |
|---|---|---|---|---|---|
| Programme Outcomes | Programme Educational Objectives | | | | |
| | PEO1 | PEO2 | PEO3 | PEO4 | PEO5 |
| PO1 | ✓ | ✓ | | | |
| PO2 | ✓ | ✓ | | | |
| PO3 | ✓ | | ✓ | | |
| PO4 | ✓ | | ✓ | | |
| PO5 | ✓ | | ✓ | | |
| PO6 | | | | ✓ | |
| PO7 | ✓ | | | ✓ | |
| PO8 | | | | ✓ | ✓ |
| PO9 | | ✓ | | | |
| PO10 | | ✓ | | ✓ | ✓ |

## THIRD SEMESTER

| 00HS301 | ENVIRONMENTAL STUDIES | L | T | P |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | | **4** | **0** | **0** |

**COURSE OBJECTIVES**

- To realize the importance of environment for engineering students.
- To understand the basis of ecosystems
- To make aware the student about global environmental problems and natural disasters.
- To give the ideas about advance technologies of Engineering that will useful to protect environment.

**Unit–I**

Introduction - Multidisciplinary nature of environmental studies - Definition, scope and importance - Need for public awareness.

Natural resources - Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

**Unit–II**

Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers -Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological - pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem - Forest ecosystem, Grassland ecosystem, Desert ecosystem,Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Unit–III**

Introduction – Definition: genetic, species and ecosystem diversity - Bio geographical classification of India - Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India -Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**Unit–IV**

Definition - Cause, effects and control measures of Air pollution - Water pollution - Soil pollution - Marine pollution- Noise pollution - Thermal pollution - Nuclear hazards- Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Disaster management: floods, earthquake, cyclone and landslides.Sustainable

development - Urban problems related to energy - Water conservation, rain water harvesting, and watershed management - Resettlement and rehabilitation of people; its problems and concerns. - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation – Consumerism and Waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of Environmental Legislation.

**Unit–V**

Population growth, variation among nations - Population explosion – Family Welfare Programme - Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health -Case Studies.

**Field Work**

Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain - Visit to a local polluted site-Urban/Rural/Industrial/Agricultural - Study of common plants, insects, birds -Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

**TEXT BOOKS**

1) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R).

**REFERENCE BOOKS**

1) Brunner, R.C., 1989. Hazardous Waste Incineration, McGraw Hill Inc. 480p.
2) Clark, R.S., Marine Pollution, Clanderson Press Oxford (TB)
3) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
4) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5) Down to Earth, Centre for Science and Environment (R).
6) Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p.
7) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
8) Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
9) Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
10) Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
11) Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB).

12) Miller, T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB).
13) Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p.
14) Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
15) Sharma, B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
16) Survey of the Environment, The Hindu (M).
17) Townsend, C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB).
18) Trivedi, R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (R).
19) Trivedi, R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publication (TB).
20) Wanger, K.D., 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p.

**(M) Magazine (R) Reference (TB) Textbook**

**COURSE OUTCOMES**

At the end students can able to

1) Understand the importance of environment.
2) Analyze the importance of environment in engineering.
3) Apply their own ideas and demonstrate advanced technologies that will be useful to protect environment.
4) Employ awareness among the society about environmental problems and natural disasters.
5) Practice according to the present and future environmental issues.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | ✓ | | | | |
| CO2 | | | | | | ✓ | | | | |
| CO3 | | | ✓ | ✓ | | | | | | |
| CO4 | | | | ✓ | | ✓ | ✓ | | | |
| CO5 | | ✓ | | ✓ | | ✓ | | | | |

| 00BS302 | ENGINEERING MATHEMATICS III | L | T | P |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | | **4** | **1** | **0** |

**COURSE OBJECTIVES**

- To learn partial and differential equations, Fourier series, Boundary value problems.
- To learn the transforms such as Sine, Cosine, Fourier transform and Z transforms
- To gain Knowledge of the method to find the solution of difference Method.

**Unit–I : Partial Differential Equations**

Formation of Partial Differential Equations by Eliminating Arbitrary Constants and Arbitrary Functions-Solution of Standard Type of First Order Partial Differential Equations-Lagrange's Linear Equation-Linear Partial Differential Equations of Second Order with Constant Coefficients.

**Unit–II : Fourier Series**

Dirichle's Conditions - General Fourier Series-Odd and Even Functions- Half Range Sine Series- Half Range Cosine Series-Complex Form of Fourier Series-Parseval's Identity.

**Unit–III : Boundary Value Problems**

Solutions of One Dimensional Wave Equation- One Dimensional Heat Equation(Without Derivation)- Fourier Series Solutions in Cartesian Co-Ordinates.

**Unit–IV : Fourier Transform**

Fourier Integral Theorem (Without Proof)- Fourier Transform Pair- Sine and Cosine Transforms-Properties-Transforms of Simple Functions – Convolution Theorem-Parseval's Identity.

**Unit–V : Z- Transform and Difference Equations**

Z – Transform – Elementary Properties- Inverse Z –Transform-Convolution Theorem-Solution of Difference Equation Using Z Transform.

**TEXT BOOKS**

1) Kandasamy, P., Thilagavathy. K. and Gunavathy, K., "Engineering Mathematics" Series. S. Chand & Co. Ltd. New Delhi. 2007.
2) Venkatraman, M.K., "Engineering Mathematics", Series, The National Pub Co., Chennai. 2003.

**REFERENCE BOOKS**

1) Veerarajan, T., "Engineering Mathematics" Series, Tata McGraw Hill Pub Co. Ltd., New Delhi, 2006.
2) Singaravelu. A., "Engineering Mathematics", Series, Meenakshi Publication, Chennai, 2004.

**COURSE OUTCOMES**

At the end of the course the students will be able to acquire knowledge on

1) Partial differential Equations and Fourier series.
2) Fourier Transform and Z-transforms.
3) Solving boundary value problems.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | ✓ | | | | | ✓ | |
| CO2 | ✓ | ✓ | | ✓ | | | | | ✓ | |
| CO3 | ✓ | ✓ | | ✓ | | | | | | |

| 00ES303 | ENGINEERING MECHANICS | L | T | P |
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**COURSE OBJECTIVES**

- To introduce the fundamentals of forces and their effects of structural bodies with specific properties.
- To understand the definitions of particle, body forces and their equilibrium conditions.
- To Understand and predict the forces and its related motions.

**Unit–I : Static of Particles**

Introduction –Units and Dimension- Law of Mechanics- Lami's Theorem-Parallelogram, Triangular and Polygon Law of Forces- Classification of Forces-Vectorial Representation of Forces-Coplanar Forces- Resolution of Forces.

Equilibrium of Particle-Vector Representation of Space Force- Equilibrium of Particle in Space - Equivalent System of Forces - Principle of Transmissibility.

**Unit–II : Equilibrium of Rigid Bodies**

Free Body Diagram- Types of Supports - Types of Loads - Types of Beams-Action and Reaction of Forces - Moment of a Couples - Moment of a Force - Vectorial Representation of Moment and Couples - Varigno's Theorem-Stable Equilibrium-Single Equivalent Force- Equilibrium of Rigid Bodies in Two Dimensions and Three Dimensions.

**Unit–III : Geometrical Properties of Surface Sand Solids**

Centroid and Centre of Gravity – Determination of Centroid of Section of Different Geometry Center of Gravity of A Body – Area Moment of Inertia – Parallel Axis Theorem - Perpendicular Axis Theorem - Determination of Moment of Inertias – of Rectangular, Triangular, Circular and Semi Circular Moment of Inertias of Structural Steel Section of Standard and Composite Section.

Polar Moment of Inertia - Radius of Gyration – Principal Moment of Inertia - Mass Moment of Inertia – Determination of Mass Moment of Inertias of a Thin Rectangular Plate, Thin Circular Disk, Solid Cylinder, Prism, Sphere and Cone From First Principles.

**Unit–IV : Dynamics of Particles**

Introduction – Kinematics and Kinetics – Displacements, Velocity and Acceleration – Equation of Motion – Types of Motion – Rectilinear Motion - Relative Motion – Curvilinear Motion – Projectiles.

Newton's Law of Motion – Linear Momentum – Impulse And Momentum - D' Alembert's Principle - Dynamic Equilibrium - Work Energy Equation – Law Of Conversion Energy – Principle of Work and Energy.

**Unit–V : Friction and Elements of Rigid Body Dynamics**

Friction Force – Lows of Sliding Friction – Equilibrium Analysis of Simple Systems with Sliding Friction – Wedge Friction.

Rolling Resistance – Translation and Rotation of Rigid Bodies - Velocity and Acceleration General Plan Motion of Simple Rigid Bodies Such as Cylinder, Desk/ Wheel and Sphere.

**TEXT BOOKS**

1) Palanichamy, M.S., and Nagan S, "Engineering Mechanism (Statics and Dynamics)", Tata McGraw Hill Publishing Company Ltd., New Delhi.
2) Beer, F.P. and Johnson, R., "Vector Mechanics for Engineers (Statics), McGraw Hill Book Company, New Delhi, 2004.

**REFERENCE BOOKS**

1) Bhavikatti, S.S. and K.G. Rajasekarappa, "Engineering Mechanism", New Agent International (P) Ltd., 1999.
2) Sadhu Sing "Engineering Mechanism", Oxford & IBH Publishing Co., New Delhi, 2000.
3) Irving H. Shames, "Engineering Mechanism", Prentice all of India Ltd., New Delhi, 2006.
4) Hibbeller, R.C. and Ashok Gupta, "Engineering Mechanism (Statics and Dynamics)", Pearson Education, 2010.
5) Natesan, S.C., "Engineering Mechanism (Statics and Dynamics)", 1st Edition, Umesh Publications, New Delhi, 2002.

**COURSE OUTCOMES**

At the end of course the students will be able to

1) Explain the forces and related laws mechanics in static and dynamic conditions.
2) Analysis of force and its motions on particle's, rigid bodies and structures.
3) Solve the moments of inertia of any section and masses for the structural members.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
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| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | ✓ | | | | | | |
| CO2 | | | ✓ | ✓ | | ✓ | | | | |
| CO3 | | ✓ | | ✓ | | | | | | |

| 10ES304 | BASIC ELECTRONICS ENGINEERING | L | T | P |
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**COURSE OBJECTIVES**

- To gain a basic knowledge on Active and passive components.
- To learn the principles of diodes and transistors suitable for various applications.
- To gain a basic knowledge on optoelectronic devices.
- To learn the concepts of analog devices.

**Unit–I : Semiconductor and PN Junction Diodes**

Energy Band Structure of Conductors, Semiconductors and Insulators-Classification of Semiconductors- Conductivity of Semiconductors-Drift and Diffusion Currents-Continuity Equation – PN Junction Diode: Construction and Characteristics - Energy Band Structure - Current Equation- Diode Resistance–Transition Capacitance-Diffusion Capacitance-Effect of Temperature on PN Junction Diodes-Diode Switching Characteristics- Half Wave - Full Wave Rectifier – Bridge Rectifier - Clipping and Clamping Circuits – Voltage Multipliers Using Diodes Zener Diode – Construction And Characteristics - as Voltage Regulator – SMPS

**Unit–II : Bipolar Junction Transistor**

Bipolar Junction Transistors: Construction – Principle of Transistor Action – CurrentComponents – Input and Output Characteristics of A Transistor in CE,CB,CC Configurations – Cut Off, Active, Saturation and Breakdown Regions – Current Gain in CE,CB,CC Configurations – H Parameter Model for BJT.

**Unit–III : Junction Field Effect Transistors**

Field Effect Transistors: Construction – Operation - Characteristics - Parameters of JFET – MOSFET: Depletion and Enhancement Modes – JFET in CS,CD,CG Configurations – Equivalent Circuits of JFET at LowFrequencies – JFET Model at High Frequencies – JFET as a Voltage Variable Resistor - JFET Specification - UJT: Construction - Theory of Operation – Characteristics.

**Unit–IV : Biasing of BJT and FET**

DC Operating Point and Load Line-Q Point-Bias Stability - Transistor Biasing Methods: Fixed Bias-Collector Feedback Bias – Emitter Feedback Bias – Collector Emitter Feedback Bias –Emitter Bias or Voltage Divider Bias- Self Bias - Stabilization Against Variations in VBE and ß for The Self Bias Circuit - Biasing Circuits for Linear Integrated Circuits - Bias Compensation Methods: Thermistor and Sensistor Compensation Techniques – Thermal Runaway - Thermal Stability - Biasing of JFET and MOSFET.

**Unit–V : Display Devices and Special Diodes**

Photo Emissivity and Photo-Conductivity-Construction and Characteristics of: LCD AND LED - Photoconductive Cell - Photo Voltaic Cell - Photo Diode - Solar Cell - Photo Transistors - Plasma Display - Numeric Displays - Opto Couplers - LASER

Diodes-Theory and Characteristics of: Schottky Diode - Tunnel Diode - Varactor Diode - SCR - TRIAC - LDR.

**TEXT BOOKS**


1) Jacob Millman, Christos Halkias and SatyabrataJit, Millman's, "Electronic Devices and Circuits", 3rd Edition, Tata McGraw Hill Education Pvt. Ltd., 2010.
2) David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press2008.


**REFERENCE BOOKS**


1) Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education, 2009.
2) Salivahanan, S., N. Sureshkumar and A. Vallavaraj, "Electronic Devices and Circuits", 2nd Edition, Tata McGraw Hill, 2008.
3) Allen Mottershead "Electronic Devices and Circuits", Prentice Hall of India, 2008.
4) Douglas A. Pucknell and Kamran Eshraghian, "Basic VLSI Design, Principles and Application", PHI, 2009.


**COURSE OUTCOMES**

Upon completion of this course the students will have

1) Knowledge on theory of basic semiconductor devices and its applications.
2) Ability to design biasing circuits for BJTs and JFETs.
3) Basic knowledge on optoelectronic devices and special diodes.
4) Knowledge on principles and applications of display devices.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
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| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | | | | | | ✓ | |
| CO2 | ✓ | ✓ | | | | | | | ✓ | |
| CO3 | ✓ | | ✓ | | | ✓ | | | ✓ | |
| CO4 | ✓ | | ✓ | | | | | | ✓ | |

| 10PC305 | NETWORK THEORY | L | T | P |
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**COURSE OBJECTIVES**

- To introduce the analysis procedures for DC and AC circuits.
- To impart knowledge on analyzing circuits using Network Theorems.
- To understand the concepts of Resonance, Transients and to develop problem Solving skills in allied circuits.
- To understand characterization of two port networks using different parameters.

**Unit–I : DC and AC Circuits**

DC Circuits – Current and Voltage Sources – Ohms Law and Kirchhoff's Law – Mesh and Nodal Analysis - Resistive Circuits – Series and Parallel Reduction method – Voltage and Current Division – Source Transformation technique - Star delta transformation – AC Circuits –Inductors, Capacitors – Voltage - Current Relationship - Steady State Analysis of RL, RC, RLC Circuits with Sinusoidal Excitation – Phasor Diagram - Power Factor – Real, Apparent and Reactive Power.

**Unit–II : Network Theorems**

Superposition Theorem – Thevenin's and Norton's Theorem – Maximum Power Transfer Theorem – Reciprocity Theorem - Compensation theorem - Tellegen's theorem- Millman's theorem.

**Unit–III : Resonance and Coupled Circuits**

Series, Parallel Resonance – Resonant Frequency –Variation of Impedance with Frequency – Bandwidth – Q-Factor.

Conductively Coupled Circuits – Mutual Inductance – Dot Convention – Coefficient of Coupling – Ideal Transformer – Tuned Circuits.

**Unit–IV : Network Transients**

Introduction – Transient Response of RL, RC, RLC, RLC (Series and Parallel) Circuits with DC Excitation and Sinusoidal Excitation – Initial condition - Solution using Differential Equation approach and Laplace Transform Method.

**Unit–V : Network Parameters and Topology**

Z, Y, ABCD and Hybrid Parameters for Two Port Networks – Interconversion of Network Parameters – Condition for Reciprocity and Symmetry – Interconnection of Two Port Networks – Network Topology – Definition – Graph – Tree – Basic Cut Set and Tie Set Matrices for Planar Networks.

**TEXT BOOKS**

1) Sudhakar, S.P. Shyammohan, "Circuits and Networks", 4th Edition, Tata McGraw Hill 2010.
2) William Hayt, Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 8th Edition, 2013.

**REFERENCE BOOKS**

1) Joseph Edminister and Mahmood Nahvi, "Schaum's Outlines Electric Circuits", Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.

2) David A. Bell, “Electric Circuits”, Sixth Edition, PHI Learning, New Delhi, 2003.
3) Charles K. Alexander and Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, 2003.

**COURSE OUTCOMES**

After successful completion of course the students will have

1) Acquired Knowledge on passive circuit elements, sources and analysis of Networks.
2) Acquired knowledge on how to apply network theorems in solving circuits.
3) Understand the concepts of Resonance and transients in the circuits.
4) Understand different networks parameters to characterize two port networks.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
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| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | | | | | | ✓ | |
| CO2 | ✓ | ✓ | | | | | | | ✓ | |
| CO3 | ✓ | ✓ | | | | | | | ✓ | |
| CO4 | ✓ | ✓ | | | | | | | ✓ | |

| 10PC306 | ELECTROMAGNETIC FIELDS | L | T | P |
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**COURSE OBJECTIVES**

- To introduce the different types of Coordinate systems.
- To encapsulate the students with Electric and Magnetic field terminologies.
- To make the students comprehend the various applications of Gauss law.
- To elucidate the different method of determining magnetic field occurring in a solenoid, toroid etc.
- To familiarize the various propagation techniques of waves and their polarization phenomenon.

**Unit–I : Electrostatic Fields**

Electric Potential and Boundary Value Problems: Absolute Potential - Potential Difference - Calculation of Potential for Different Configurations - Potential Gradient - Electric Dipole - Energy Density in the Electrostatic Field. Laplace's Equation - Poisson's Equation - Solution of Laplace's Equation in one Variable - Solution of Laplace's Equation in Two Variable Using Variable Separable Method - Solution of Poisson's Equation.

**Unit–II : Electric Fields**

Vector Analysis: Nature of Scalars and Vectors -Vector Algebra, Vector Differential Operator - Gradient, Divergence and Curl Operators - Line, Surface and Volume Integrals - Cartesian, Cylindrical and Spherical Co-Ordinate Systems. Static Electric Fields: Coulomb's Law-Electric Field Intensity- Calculation of Electric Field Intensity due to Different Charge Configurations - Point Charge, Line Charge, Surface Charge and Volume Charge - Electric Flux Density - Gauss's Law - Application of Gauss's Law - Gauss's Divergence Theorem.

**Unit–III : Conductors and Dielectrics**

Conductors and Dielectrics: Electrostatic Fields in Conductors and Dielectrics - Current and Current Density – Continuity Equation - Conductor Properties and Boundary Conditions - Method of Images - Nature of Dielectric Materials - Boundary Conditions for Perfect Dielectric Materials - Capacitance -Energy Storage in a Capacitor-Determination of Capacitance for Different Configurations – Parallel Plate Capacitor, Co-Axial Cable, Spherical Capacitor and Two-Wire Transmission Line.

**Unit–IV : Magnetic Fields**

Steady State Magnetic Field: Biot-Savart's Law - Ampere's Circuital Law - Curl and Stoke's Theorem - Determination of Magnetic Field Due to an Infinitely Long Straight Filament Carrying Current, Finite Length Current Element and Current Loop - Determination of Field Using Ampere's Circuital Law for Symmetrical Current Distributions - Infinitely Long Filament, Solenoid of Finite Length, Toroid and Coaxial Cable- The Scalar and Vector Magnetic Potentials - Magnetic Boundary Conditions - Potential Energy in the Magnetic Field.

**Unit–V : Electromagnetic Waves**

Modified Ampere's Circuital Law – Maxwells Equations in Point and Integral Forms – Poyntings Theorem – Energy in Electromagnetic Field – Slepian Vector – Wave Equation – Characteristics Impedance – Wave Propagation – Depth of Penetration – Polarization – Reflection and Refraction – Plane Waves – Surface Waves.

**TEXT BOOKS**

1) William H. Hayt, "Engineering Electromagnetics", 5th Edition, McGraw Hill Kogakusha Ltd, 1995.
2) David K. Cheng, "Field and wave Electromagnetics", 2nd Edition, Pearson Education, Asia 2002.

**REFERENCE BOOKS**

1) Gupta P.V., "Introduction to Electromagnetic Fields", Dhanpatrai and Sons, 1986.
2) Gangadhar K.A, "Field Theory", Khanna Publishers, 1987.
3) Skitek. G.G., Marshall. S.V, "Electromagnetic Concepts and Applications", 3rdEdition, Prentice Hall, 1990.
4) Sathaiah. D and Anitha. M, "Electromagnetic Fields", Scitech Publications (India), Pvt. Ltd. Chennai, 2007.

**COURSE OUTCOMES**

At the end of course students will be

1) Familiar with vector analysis of electromagnetic fields.
2) Able to understand Vector electrostatic principles.
3) Correlate the various Concepts of electromagnetic fields.
4) Imparted knowledge related to various Terminologies of Electric and Magnetic Fields, important laws governing EM wave, Maxwell's Equation.
5) Design components for various applications using the above techniques

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
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| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | ✓ | |
| CO2 | ✓ | ✓ | | | | | | | ✓ | |
| CO3 | ✓ | ✓ | | | | | | | ✓ | |
| CO4 | ✓ | ✓ | | | | | | | ✓ | |
| CO5 | ✓ | | ✓ | | | ✓ | | | | |

| 10SP307 | BASIC ELECTRONICS ENGINEERING LAB | L | T | P |
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**COURSE OBJECTIVES**

- To verify the characteristics and applications of various semiconductor devices.

**LIST OF EXPERIMENTS**

1) Study of colour codes and soldering practice
2) Characteristics of junction diode, Zener diode
3) Zener diode as voltage regulators.
4) Half wave and full wave rectifiers without filter
5) Half wave and full wave rectifiers with filter
6) Simulate the wave shaping circuit using MultiSim
7) Transistor biasing circuits
8) Study of characteristics of transistor using MultiSim
9) Characteristics of FET
10) Characteristics of UJT
11) Characteristics of SCR
12) Characteristics of LDR and Photo Transistor.

**COURSE OUTCOMES**

At the end of course students will

1) Understand the practical characteristics of Diodes, BJT and JFET.
2) Apply principles and characteristics of semiconductor devices in designing simple application circuits.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | | |
| CO2 | ✓ | | ✓ | | | | | | | |

| 10CP308 | CIRCUITS AND NETWORKS LAB | L | T | P |
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**COURSE OBJECTIVES**

1) To verify basic laws on circuits and verify various network theorems.
2) To understand Resonance concepts in AC circuits.
3) To compute parameters for single and cascaded two-port Network.

**LIST OF EXPERIMENTS**

1) Verification of Ohm's Law
2) Verification of Kirchoff's Current Law
3) Verification of Kirchoff's Voltage Law
4) Verification of Superposition Theorem
5) Verification of Thevinin's and Norton's Theorem
6) Verification of Maximum Power Transfer Theorem
7) Verification of Reciprocity Theorem
8) Study of AC circuits.
9) Study of Resonance Circuits
10) Computation of Network Parameters for Symmetric Network
11) Computation of Network Parameters for Asymmetric Network
12) Network Parameters for Cascaded Network.

**COURSE OUTCOMES**

At the end of course students will

1) Understand how to analyze circuits using Network theorems.
2) Acquire knowledge on resonance concepts in AC circuits.
3) Model networks using Network Parameters.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
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| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | ✓ | | ✓ | | | | | | | |

## FOURTH SEMESTER

| 10BS401 | PROBABILITY, RANDOM PROCESSES AND NUMERICAL METHODS | L | T | P |
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**COURSE OBJECTIVES**

- To expose the students to probability, random process, and statistical methods designed
- To contribute them to the process of making scientific judgments in the face of uncertainly and variation.
- To develop the skill of the students in numerical mathematics - using method of finite difference interpolation, finding numerical solution of ordinary and partial differential equation.

**Unit–I : Probability and Random Variables**

Definition – Types of Random Variables - Probability Distribution Function - Probability Density Function – Expectation and Moments – Moment Generating Functions – Joint Probability Distribution – Marginal Probability Distribution Function – Joint Probability Density Function – Marginal Probability Density Function - Conditional Probability Density Function.

**Unit–II : Random Processes**

Classification of Random Processes – Methods of Description of a Random Process – Special Classes of Random Processes – Average Values of Random Process Stationary – Auto Correlation Function and its Properties – Cross Correlation Function and its Properties.

**Unit–III : Test of Significance**

Hypothesis, Testing – Large Sampling Tests – Small Sampling Test Based on t, F and Chi Square Distributions – Interval Estimates of Mean, Standard Derivation and Proportion.

**Unit–IV : Interpolation**

Gregory Newton Forward and Back Word Interpolation Formula; Sterling's Central Difference Formula; Lagrange's Interpolation Formula for Unequal Interval, Inverse Interpolation Numerical Differentiation; Using Newton Forward and Back Word Interpolation Formula, Numerical Integration; Trapezoidal Rule; Simpson's One Third and Three Eight Rule.

**Unit–V : Solution of Algebraic and Transcendental and Ordinary Differential Equations**

Solution of Algebraic and Transcendental Equations; Bolzano's Bisection Method; Regulation - Falsi Method; Newton – Raphson Method; Solution of Simultaneous Algebric Equation; Gauss Elimination Method; Crout's Method; Gauss – Seidel Iteration Method; Solution of Ordinary Differential Equations; Taylor Series Method; Runge – Kutta Fourth order Method Miline's- Predictor Corrector Method.

**TEXT BOOKS**

1) Kandasamy.P, Thilagavathy.K, and Gunavathy.K, Probability and Random Process, S.Chand& Co. Ltd.
2) Veerarajan. T., Probability theory and Random Process, Tata McGraw – Hill Co., Ltd. New Delhi 2005.

**REFERENCE BOOKS**

1) Venkataraman M.K., Numerical method in science and Engineering, National publishing Co., Chennai - 2003.
2) Lipschutz..S and Schiller. J, Schaums‟s outlines – Introduction to Probability and Statistics, McGraw Hill, New Delhi, 1998.
3) Kandasamy.P, Thilagavathy.K, and Gunavathy.K, Numerical Methods, S. Chand & Co. Ltd., New Delhi, 2004.

**COURSE OUTCOMES**

At the end of the course, the students would

1) Acquire skills in handling situations involving random variables, random process and solve problems for engineers in using numerical methods.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
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| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |

| 0ES402 | MATERIAL SCIENCE | L | T | P |
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**COURSE OBJECTIVES**

- To impart fundamental understanding of how the various properties of materials drawn from different length scales of electronic and molecular structures that can be used in designing electronic devices.
- To gain vast knowledge of various conducting, superconducting, semiconducting, magnetic, dielectric, optical, smart and nano composite materials.

**Unit–I : Conducting Materials**

Classical Free Electron Theory of Metals - Electrical Conductivity of Al - Drawbacks of Classical Theory - Quantum Free Electron Theory of Metals and its Importance - Density of States - Fermi-Dirac Statistics - Calculation of Femi Energy and its Importance - Concept of Hole-Origin of Band Gap in Solids (Qualitative Treatment Only) - Effective Mass of Electron - High Resistivity Alloys Superconductors - Properties and Applications.

**Unit–II : Semiconducting Materials**

Elemental and Compound Semiconductors and Their Properties - Carrier Concentration Intrinsic Semiconductors - Carrier Concentration in N - Type and P - Type Semiconductors - Variation of Fermi Level and Carrier Concentration with Temperature - Hall Effect – Applications.

**Unit–III : Magnetic and Dielectric Materials**

Different Types of Magnetic Materials and Their Properties - Domain Theory of Ferromagnetism - Heisenberg Criteria - Hysteresis Energy Product of a Magnetic Material - Merits and Their Applications - Magnetic Recording Materials - Metallic Glasses - Active and Passive Dielectrics and their Applications - Ferro Electrics – Piezo Electrics.

**Unit–IV : Optical Materials**

Optical Properties of Metals, Insulators and Semiconductors - Phosphorescence and Fluorescence - Excitons, Traps and Colour Centres and their Importance- Different Phosphors Used in CRO Screens - Liquid Crystal as Display Material - Thermography and its Applications - Photoconductivity and Photo Conducting Materials.

**Unit–V : New Engineering Materials**

Metallic Glasses as Transformer Core Materials - Nano Phase Materials - Shape Memory Alloys -Bio-Materials - Non - Linear Materials – Second Harmonic

Generation - Optical Mixing – Optical Phase Conjugation – Solutions – IC packaging material.

**TEXT BOOKS**

1) Arumugam. M., "Materials Science", Anuradha Technical Book Publishers, 2005.
2) Indulkar. C.S. and Thiruvengadem. S, "Introduction to Electrical Engineering Materials", 5th Edition, S.Chand& Co New Delhi, 2010.

**REFERENCE BOOKS**

1) Donald R. Askland and Pradeep P. Phule, "The Science and Engineering of Materials", 5th Edition, Cengage Learning Publisher, USA, 2006
2) Sze, S.M. and Kwok K., "Physics of Semiconductor Devices", 3rd Edition, John Wiley, India, 2007.
3) Pillai, S.O., "Solid State Physics", 6th Edition, New Age International Publisher, India, 2009.
4) Dekker, A.J., "Electrical Engineering Materials" Prentice Hall of India, 2006.
5) Van Vlack, L.H., "Material Science for Engineers", Addison Wesley, 2000.
6) Raghavan. V., "Materials Science and Engineering", Prentice Hall of India, New Delhi, 2005.

**COURSE OUTCOMES**

At the end of the course, the students would

1) Acquire knowledge of a wide variety of materials.
2) Analysis of suitability of materials for various applications in designing products useful for the society.
3) Gain knowledge of new engineering materials such as nano and optical materials.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
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| Course Outcomes | Programme Outcomes | | | | | | | | | |
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| CO1 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | | ✓ | | | | ✓ |

| 10PC403 | ELECTRONIC CIRCUITS | L | T | P |
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**COURSE OBJECTIVES**

- To gain knowledge about the basic electronic circuits
- To acquire an in-depth knowledge of low frequency and high frequency analysis of BJT and FET amplifiers
- To design large signal amplifiers and tuned amplifiers
- To design feedback amplifiers and oscillators
- To design the wave shaping circuits

**Unit–I : Small Signal Low Frequency Models**

Frequency Response of an Amplifier — Distortion in Amplifier – RC Coupled Amplifier – Analysis of Transistor Amplifier Circuit Using H Parameters – Comparison of Transistor Amplifier Configuration - Classification of Amplifier - Low Frequency Response of an RC Coupled Stage – Cascaded Common Emitter Transistor Stages - Cascading Transistor Amplifier – Simplified Calculation for CB, CE and CC Configurations – Emitter Follower - Millers Theorem – High Input Resistance Transistor Circuits - JFET Small Signal Model - MOSFET – Common Source Amplifier - Common Drain Amplifier.

**Unit–II : High Frequency Models**

High Frequency T Model – CB and CE Short Circuit Current Frequency Response – Alpha Cut Off Frequency - Hybrid Pi CE Transistor Model – Hybrid Pi Conductance's in Terms of Low Frequency H Parameters – CE Short Circuit Current Gain Obtained with the Hybrid Pi Model – Current Gain With Resistive Load – Transistor Amplifier Response Taking Source Resistance into Account - High Frequency Response of a FET Stage.

**Unit–III : Feedback Amplifiers and Oscillators**

Feedback Concept – Types of Feedback- Properties of Negative Feedback - Analysis of Voltage and Current Feedback Amplifiers - Effect of Feedback Amplifier on Noise, Distortion, Gain, Input and Output Impedance.

Barkhausen Criterion - Design of Oscillators - Mechanism for Start of Oscillation and Stabilization of Amplitude – Analysis of RC, LC Oscillators and Crystal Oscillator – Frequency Stability – Negative Resistance Oscillators.

**Unit–IV : Large Signal and Tuned Amplifiers**

Classification of Large Signal Amplifiers-Class A, B, C, D and AB Amplifiers Operation - Efficiency - Class A Amplifier With Load - Class B Push-Pull Amplifier - Distortion in Amplifiers - MOSFET Power Amplifier - Tuned Amplifiers - Single, Double And Stagger Tuned Amplifiers.

**Unit–V : Multivibrators**

Design of Monostable, Bistable and Astable Multivibrators - Schmitt Trigger - Monostable and Astable Blocking Oscillators using Emitter Based Timing - UJT Saw Tooth Generator.

**TEXT BOOKS**

1) Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education, 2012.
2) Millman.J and Halkias .C, "Integrated Electronics", Tata McGraw-Hill, 2007.

**REFERENCE BOOKS**

1) David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press 2008.
2) Thomas L Floyd," Electronic Devices", 7th Edition, Pearson Education, 2005.
3) I.J. Nagrath," Electronic Devices and Circuits",1st Edition, PHI, 2007.

4) S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, "Electronic Devices and Circuits", 2nd Edition, TMH, 2007.
5) Jacob Millman and Taub, "Pulse, Digital and Switching Waveforms", 2nd Edition, 2007.

**COURSE OUTCOMES**

At the end of this course the students will

1) Analyze amplifiers at low and high frequencies
2) Understand the working of different types of feedback amplifiers & oscillators.
3) Able to analyze and design large signal and tuned amplifiers.
4) Analyze and design of wave shaping circuits.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | | ✓ | | | | | | | ✓ | |
| CO2 | ✓ | ✓ | | | | | | | ✓ | |
| CO3 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO4 | ✓ | ✓ | ✓ | | | | | | ✓ | |

| 10PC404 | DIGITAL ELECTRONICS | L | T | P |
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**COURSE OBJECTIVES**

- To introduce Number systems and arithmetic operations on binary numbers.
- To introduce basic postulates of Boolean algebra, Boolean functions and methods to simplify Boolean expressions.
- To acquire knowledge on design and analysis of combinational circuits.
- To understand the realization of combination circuits using PLDs
- To outline the procedures for analysis and design of synchronous and asynchronous sequential circuits.
- To introduce different logic families, semiconductor memories and related technology.

**Unit–I : Introduction**

Number system and their Interconversions-Complements-Representation of Signed binary numbers - Binary arithmetic - Floating Point Numbers –Binary codes: BCD,84-2-1, Excess 3, Gray and Alpha numeric codes. Boolean algebra-Postulates and theorems - Boolean functions-Canonical and Standard forms-Minimization techniques: Karnaugh map minimization (SOP and POS minimization)-Don't care conditions-Tabulation method-Implementation of logic functions using gates –NAND and NOR implementation.

**Unit–II : Combinational Logic and PLDs**

Design procedure-Half adder - Full adder-Half subtractor- Full subtractor-Parallel binary adder-Parallel adder/subtractor- BCD adder-Binary multiplier-Code convertors-Magnitude comparator-Parity generator and checker-Decoders-Encoders-Priority encoder-Multiplexer and Demultiplexer-Implementation of

combinational logic using Multiplexer-Programmable Logic Devices-PROM-PLA-PAL-Implementation of combination logic using PLDs.

**Unit–III : Synchronous Sequential Logic**

Flip-flops –SR, D, JK, T Flip-flops, Master-Slave flip-flop- Triggering of Flip-Flops-Flip-Flop Excitation table-Moore and Mealy models- Analysis and Design of clocked sequential circuits-State Minimization –State assignment-Circuit Implementation-Design of Counters – Synchronous counters - Ripple counters-BCD counter-Modulo-N counters-Shift registers-Universal Shift register-Johnson and ring counter.

**Unit–IV : Asynchronous Sequential Logic**

Introduction-Modes of operation- Fundamental Mode asynchronous Circuits-Analysis of Fundamental mode asynchronous Circuits-Analysis of a circuit with SR Latches-Design Procedure-Reduction of state and flow tables-Cycles, Races-Race free state assignments-Hazards-Essential Hazards-Pulse mode asynchronous circuits.

**Unit–V : Digital Logic Families and Semiconductor Memories**

Characteristics of digital IC-logic families: RTL and DTL-TTL-ECL-MOS-CMOS-Comparison of various logic families-Semiconductor memories-ROM and RAM organization- Basic Memory cell - Memory decoding-Memory expansion-Static and Dynamic RAM.

**TEXT BOOKS**

1) William H. Gothmann, "Digital Electronics", 2nd Edition, Prentice Hall, 2001.
2) R.Ananda Natarajan, "Digital Design", PHI, 2011.

**REFERENCE BOOKS**

1) M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India, 2008.
2) R.P. Jain, "Modern Digital Electronics", 4th Edition, Tata McGraw-Hill Education, 2010.
3) John F. Wakerly, "Digital Design", 4th Edition, Pearson Edition, 2008.
4) Charles H. Roth, "Fundamentals of Logic Design", 4th Edition, Jaico *Publishing* House, 2002.
5) Anil K. Maini, "Digital Electronics: Principles, Devices and Applications", John Wiley and Sons, 2007.
6) Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson Edition, 2007.

**COURSE OUTCOMES**

Upon completion of the course the students will be able to

1) Explain number system and Boolean postulates and Realize Boolean functions with minimum number of logics.
2) Design and analyze combinational circuits and Implement combinational logic in PLDs.
3) Design and implement synchronous and asynchronous sequential circuits
4) Describe various logic families in digital IC.
5) Understand semiconductor memories and related technology.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | ✓ | |
| CO2 | | ✓ | ✓ | ✓ | | | | | ✓ | ✓ |
| CO3 | | ✓ | ✓ | ✓ | | | | | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO5 | ✓ | ✓ | ✓ | | | | | | ✓ | |

| 10PC405 | TRANSMISSION LINES AND WAVEGUIDES | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

- To introduce basic concepts of transmission lines
- To learn the characteristics of low and radio frequency lines
- To study various impedance matching devices
- To learn Smith chart and its applications in transmission line problems
- To design passive filters attenuators, and equalizers
- To study waveguide theories.

**Unit–I : Transmission Line Theory**

Transmission lines - open wire and co-axial line – primary and secondary constants – symmetrical T and Π networks – transmission line equation – physical significance of line equation – Infinite line – wavelength, phase velocity, group velocity – waveform distortion - distortion less line – telephone cable – inductance loading of telephone cables – reflection on line not terminated in characteristic impedance - Reflection coefficient - Reflection factor - Reflection loss – input and transfer impedance – equivalent T and Π models .

**Unit–II : Line at Radio Frequencies**

Parameters of open wire line and co-axial lines at radio frequencies – line constants at zero dissipation – voltage and current on dissipation less line - Standing waves – standing wave ratio - input impedances of a dissipation less line – input impedance of open and short circuit lines – eighth wave line (λ/8) – quarter wave line (λ/4) - Impedance matching – half wave line (λ/2) - Single and double stub matching –smith chart and its applications.

**Unit–III : Transmission Line Measurements and Filters**

VSWR, Impedance, Power Measurements on Transmission Lines – Characteristic Impedance and Propagation Constant of Symmetrical Networks- Filter Fundamentals - Constant K Filters– Low Pass, High Pass, Band Pass And Band Stop Filters - M-Derived T Sections – M-Derived Π Sections - Composite Filters.

**Unit–IV : Attenuators and Equalizers**

Symmetrical T and Π Attenuators- Bridged T Attenuators-Lattice Attenuators- Asymmetrical T and Π Attenuators - Balanced and Unbalanced Attenuators-Ladder Attenuators- Variable Attenuators. Equalizers: Classification of Equalizers- Series and Shunt Equalizers- Full Series Equalizers- Full Shunt Equalizers- Bridged T Equalizers-Lattice Equalizers.

**Unit–V : Waveguides**

Solutions of Wave Equations in Rectangular Coordinates – TE And TM Modes in Rectangular Waveguides – Impossibility of TEM Mode in Rectangular Waveguides- Excitation of Modes In Rectangular Waveguides. Circular Waveguides: Solutions of Wave Equations in Circular Waveguides – TE, TM and TEM Modes in Circular Waveguides- Excitation of Modes in Circular Waveguides.

**TEXT BOOKS**

1) J.D. Ryder, "Networks Lines and Fields" Second Edition, PHI New Delhi, 2003.
2) Umesh Sinha, "Transmission Lines and Networks", SatyaPrakashan Publishers, 2001.

**REFERENCE BOOKS**

1) Jordan, "Electromagnetic Waves and Radiating Systems", Second Edition, Dorling Kindersley (India) Pvt. Ltd., 2006.
2) S. Ramo and J.R. Whinnery, "Fields and Waves in Communication Eelectronics", 3rdEdition, John Wiley and Sons, 1994.
3) Samuel Y Liao, "Microwave Devices and Circuits" 3rd Edition, Pearson Education, 1996.

**COURSE OUTCOMES**

Upon completion of the course the students will be able to

1) Understand the fundamentals of transmission lines
2) Understand loading concepts in cables
3) Explain the need for impedance matching in radio frequency lines
4) Analyze and design various network elements(filters, attenuators and equalizers)
5) Explain propagation of EM waves in rectangular and circular waveguides

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | ✓ | |
| CO2 | ✓ | ✓ | | ✓ | | | | | ✓ | |
| CO3 | ✓ | ✓ | | | | | | | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |
| CO5 | ✓ | ✓ | ✓ | | | | | | ✓ | |

| 10PC406 | SIGNALS AND SYSTEMS | L | T | P |
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**COURSE OBJECTIVES**

The aim of the course is for

- Understanding the fundamental characteristics of signals and systems.
- Understanding signals and systems in terms of both the time and transform domains,
- Development of the mathematical skills to solve problems involving convolution, Filtering, modulation and sampling.

**Unit–I : Introduction to Signals and Systems**

Signals – Continuous Time and Discrete Time Signals – Elementary Signals – Basic Operations on Signals - Classification of signals – Periodic and Aperiodic Signals - Energy and Power – Even and Odd signals – CT Complex Exponential And Sinusoidal Signals – DT Complex Exponential and Sinusoidal Signals- Representation of continuous time and Discrete time signals in terms of Impulses – Continuous Time and Discrete Time Systems – Properties of Systems – Sampling - Sampling Theorem for Lowpass and Bandpass Signals..

**Unit–II : Fourier Analysis**

Fourier Series Representation of Continuous Time Periodic Signals – Properties of Continuous Time Fourier Series – Convergence of Fourier Series – Representation of Aperiodic Signals – Continuous Time Fourier Transform – Properties of Continuous Time Fourier Transform.

**Unit–III : Continuous Time LTI Systems**

Convolution Integral Representation of LTI-CT Systems – Properties of LTI-CT Systems – Causal LTI systems described by Differential Equations – Solution of Differential Equations –Analysis and Characterization of LTI-CT system using Laplace transform.

**Unit–IV : DTFT and Z Transform**

Discrete time Fourier transform (DTFT) – Properties of DTFT – Time and frequency shifting – Conjugation – Parseval'srelation – Z transform and its properties – Region of Convergence – Pole-Zero Representation – Inverse Z-transform – Relationship between Z-transform and Fourier Transform.

**Unit–V : Discrete Time LTI Systems**

Convolution Sum Representation of LTI-DT systems – Properties of LTI-DT systems – Causal LTI Systems described by Difference Equations – Solution of Difference Equation – Analysis and Characterization of LTI-DT system using Z-transform.

**TEXT BOOKS**

1) Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, "Signals and Systems", 2nd Edition, Prentice Hall of India, 1997.
2) P. Ramesh Babu and R. Anandanatarajan, "Signals and Systems", 4th Edition, Scitech, 2011.

**REFERENCE BOOKS**


1) Simon Haykin, Barry Van Veen, "Signals and Systems" John Wiley and Sons (Asia) Pvt. Ltd., 1999.
2) Rodger E *Ziemer*, William H *Tranter* and D Ronald Fannin, "Signals and Systems: Continuous and Discrete", 3rd Edition, Maxwell Macmillan, 1993.
3) Michel J *Robert*, "Signals and Systems Analysis Using Transformation. Methods and MATLAB", 1stTata McGraw Hill, 2003.
4) R.A. Gabel and R.A. Richard, "Signals and Linear Systems", John Wiley and Sons, 1987.
5) Gordan E Carlson, "Signals and Linear Systems Analysis", Allied Publishers, New Delhi, 1993.


**COURSE OUTCOMES**

At the end of this course, the students will be able to understand

1) Representation and classification of both Continuous Time (CT) and Discrete Time (DT) signals and systems.
2) Spectral analysis of periodic and aperiodic signals using Fourier series and Transforms.
3) Analysis and characterization of the LTI-CT system through Laplace Transform.
4) Analysis and characterization of the LTI-DT system through Z transform.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | ✓ | |
| CO2 | ✓ | ✓ | | | | | | | ✓ | ✓ |
| CO3 | ✓ | ✓ | | | | | | | ✓ | |
| CO4 | ✓ | ✓ | | | | | | | ✓ | |

| 10CP407 | ELECTRONIC CIRCUITS AND DESIGN LAB | L | T | P |
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**COURSE OBJECTIVES**

- To Design BJT and FET amplifiers and to study their frequency characteristics.
- To design Oscillators using discrete components and using MultiSim software.

**LIST OF EXPERIMENTS**

1) Frequency response of BJT amplifier
2) Frequency response of FET amplifier
3) Design and analysis of Differential Amplifiers.
4) Design and analysis of feedback amplifier
5) Design of RC phase shift oscillator
6) Design of Class B power amplifier
7) Design of Single tuned amplifiers.
8) Design of a stable Multivibrator using transistors

9) Design of Schmitt trigger
10) Design and Simulation of Bistable multivibrator using Multi Sim
11) Design and Simulation of Complementary Symmetry push pull amplifier using Multi Sim
12) Design and Simulation of Hartley oscillator using Multi Sim
13) Design and Simulation of Colpitt's oscillator using Multi Sim.

**COURSE OUTCOMES**

At the end of course students will

1) Design Oscillators and amplifiers using discrete components.
2) Able to use Multi Sim software for design and analysis of electronic circuits.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | | | | | | | |
| CO2 | | ✓ | | | ✓ | | | | | |

| 10CP408 | DIGITAL ELECTRONICS LAB | L | T | P |
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**COURSE OBJECTIVES**

- To Design Combinational and sequential Digital circuits.

**LIST OF EXPERIMENTS**

1) Study of Logic Gates.
2) Design of Unit–Adders and Subtractors,
3) Design and Implementation of Binary Four-bit parallel adder.
4) Design of Code Convertors.
5) Design of Multiplexer and Demultiplexer.
6) Design of encoders and Decoders.
7) Study of Flip Flops
8) Construction of Shift Register
9) Design of Modulo Counters.
10) Design of Non Sequential Counter
11) Frequency Divider using IC7490
12) Design of Sequence Generator and Detector
13) Study of Fault Diagnosis in Combinational Circuits.

**COURSE OUTCOMES**

Upon successful completion of this course, the students will be able to

1) Design simple combinational logic circuits using gates and verify their functionalities.
2) Understand the characteristics of flip-flops and apply the design Procedures to design basic sequential circuits.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | ✓ | | | | | | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | | | | | |

**FIFTH SEMESTER**

| 10PC501 | ANALOG COMMUNICATION SYSTEMS | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

- To give a brief knowledge in random process and sources of noise in Communication Systems
- To expose the concepts of basic communication in analog domain and Amplitude modulation/demodulation
- To familiarize the Angle modulation/ demodulation
- To know the working knowledge of the fundamental pulse modulation

**Unit–I : Introduction to Random Process and Noise Theory**

Random Process Definition - Stationary Process – Mean – Autocorrelation - PSD of Stationary Process – Gaussian Process.

Noise – Shot Noise, Thermal Noise, White Noise, Narrow Band Noise –Time domain representation of Narrow Band Noise - Signal to Noise Ratio, Probability of Error – Noise Band Width - Effective Noise Temperature- Noise Figure.

**Unit–II : Amplitude Modulation**

Introduction-communication system model-modulation-Need for modulation-Amplitude modulation- AM with carrier-DSB-SC-SSB-SC – VSB-Time and frequency domain representation-Bandwidth requirements and power relations-Generation and Detection of AM with carrier signal-Square Law Modulator, Square Law Detector, Envelope Detector- Generation and Detection of DSB-SC signal-Balanced Modulator, Ring Modulator, Coherent Detection-Costas Loop- Generation and Detection of SSB-SC signal-Phase discrimination method, Coherent detection-Comparison of AM systems-Frequency Division multiplexing.

**Unit–III : Angle Modulation**

Basic Definitions, Types of Angle Modulation, Relationship between PM and FM Frequency deviation – Types of FM – Single tone Narrow Band, Wide-Band FM , Remarks about PM – Multi tone Wide-Band FM – Transmission Bandwidth of FM Waves– FM Modulators–Parameter Variation Method (Direct Method), Armstrong method (Indirect Method) – FM Demodulators – Slope Detector, Balanced Slope Detector, Foster Seely Discriminator – Ratio Detector.

**Unit–IV : Transmitters and Receivers**

AM transmitter – low level transmitter, high level transmitter – AM Receivers – TRF receivers, Superheterodyne receivers– Noise in AM systems.

FM transmitter - Direct and Indirect Method of Frequency Modulation – FM Superheterodyne Receiver–Effect of Noise in Angle Modulated Systems – Threshold Effect in FM system - Threshold Improvement - Pre-emphasis and De-emphasis Circuits – Frequency Modulation with Feedback(FMFB).

**Unit–V : Analog Pulse Modulation**

Sampling of Band Limited Low Pass Signals-Pulse Amplitude Modulation-Generation and Detection-Time Division Multiplexing-Pulse Time Modulation-Generation and Detection of PTM Signals-cross talk in PTM-Bandwidth of PTM signals-performance of pulse modulation systems.

**TEXT BOOKS**


1) R.P. Singh and S.D. Sapre," Communication Systems Analog and Digital", 2nd Edition, Tata McGraw- Hill Publishing, 2007.
2) J.G. Proakis, M. Salehi, “Fundamentals of Communication Systems”, Pearson Education 2006.


**REFERENCE BOOKS**


1) Wayne Tomasi, “Electronic Communication Systems-Fundamentals Through Advanced”, 5th Edition, Pearson Education, 2004.
2) SimonHaykins,“Communication Systems”, 4th Edition, John Wiley, 2007.
3) Taub and Schilling, “Principles of Communication Systems”, 4th Edition McGraw Hill, 2013.
4) H.P. Hsu, Schaum Outline Series - “Analog and Digital Communications”, 2nd Edition TMH, 2006.
5) B. Carlson, “Introduction to Communication Systems”, 5th Edition, McGraw Hill, 2009.
6) Kennedy G., Bernard Davis "Electronic Communication Systems", McGraw Hill, 5thEdition, Reprint, 2011.


**COURSE OUTCOMES**

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

1) Discuss principles of different analog modulation Techniques
2) Analyze and Design AM and FM modulation and Demodulation circuits.
3) Analyze the noise performance of AM and FM systems
4) Describe various pulse modulation techniques.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | ✓ | |
| CO2 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO3 | | ✓ | | | | | | | ✓ | |
| CO4 | ✓ | ✓ | | | | | | | ✓ | |

| 10PC502 | ANALOG INTEGRATED CIRCUITS | L | T | P |
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**COURSE OBJECTIVES**

The student is expected to have the knowledge about

- Working of operational amplifiers and various applications of op-amp such as Multivibrators, Oscillators and filters.
- The theory of ADC and DAC and the concepts of waveform generation and some special Function ICs.
- Micro fabrication techniques of optical integrated circuits and optical wave guides, opto electronic integrated circuits.

**Unit–I : Introduction to Linear IC's**

Integrated circuits – monolithic integrated circuits – active and passive components of IC - fabrication of monolithic IC's -ideal op-amp - practical op-amp - Various stages of an operational amplifier - simplified schematic circuit of op-amp 741 – op-amp characteristics - offset current and offset voltage - frequency response of an op-amp - noise analysis - slew rate.

**Unit–II : Applications of Op – Amp**

DC amplifier – AC amplifier - Inverting and Non-inverting Amplifiers - Summing, scaling and Averaging amplifiers - Logarithmic Amplifiers - antilog amplifier - Instrumentation Amplifiers - Differential Amplifiers -Voltage to Current Converters - Current to Voltage Converters – Integrators – Differentiators.

**Unit–III : Active Filters & Oscillators**

Active filters - Butterworth filters: First order and Second Order Low-Pass filters -First order and Second Order High-Pass filters – Band-Pass filters: wide band-pass filters - narrow band-pass filters – Band-reject filters: wide band-reject filters and narrow band-reject filters - Oscillators: Oscillator Principles, Oscillator types - phase shift Oscillator - Wien Bridge Oscillator - voltage–controlled oscillator.

**Unit–IV : Comparators and Converters**

Basic Comparator: Comparator characteristics - Zero Crossing Detector – Schmitt Trigger – high speed and precision type comparators - window Detector – Voltage to Frequency converter - Frequency to Voltage converter - D/A converters - A/D Converters - Clippers and Clampers – positive and negative clippers – small-signal and half-wave rectifier – positive and negative clampers - Peak Detector – sample and hold circuit.

**Unit–V : Waveform Generators and other Linear IC's**

Square wave generator – triangular wave generator - saw tooth wave generator – Switched capacitor filter - The 555 Timer –555 Timer as an astable, bistable, monostable multivibrators– power amplifiers - voltage regulators - Three Terminal fixed and adjustable Regulators - switching regulators - Operation of the basic PLL - Monolithic PLL – 565 PLL Applications.

**TEXT BOOKS**

1) Gayakwad R.A. "Op amp and Linear Integrated Circuits", Second Edition, PHI. 1988.
2) Roychoudhury and Shail Jain "Linear Integrated Circuits", Wiley Eastern 1991.

**REFERENCE BOOKS**


1) Jacob Millman and Arvin Grabel, “Micro Electronics" (2nd edition), McGraw Hill, 1987.
2) Gray and Meyer, “Analysis and design of analog IC's”, Wiley International - 1996.
3) Paul R. Gray, Paul J. Hurst, Robert G. Meyer, Stephen H. Lewis, “Analysis and Design of Analog Integrated Circuits”, 4th education.
4) Sidney Soclof, “Applications of Analog Integrated circuits”, PHI, 1990.


**COURSE OUTCOMES**

Upon completion of the course the students will

1) Gain knowledge of IC fabrication
2) Have an in depth knowledge of applications of op – amps
3) Design different types of active filters and oscillators
4) Acquire knowledge about comparators and converters
5) Generate Sinusoidal and non-sinusoidal waveforms using op – amp circuits.
6) Analyse special function ICs like 555 Timer.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | | | | | ✓ | |
| CO3 | | ✓ | ✓ | | | | | | ✓ | |
| CO4 | ✓ | ✓ | | | | | | | ✓ | |
| CO5 | | | ✓ | | | | | | ✓ | |
| CO6 | | ✓ | | | | | | | ✓ | |

| 10PC503 | MICROPROCESSOR AND MICROCONTROLLER | L | T | P |
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**COURSE OBJECTIVES**

The student should be made to:

- Study the Architecture of 8085 and 8086 microprocessor.
- Learn the detail aspects of I/O and Memory Interfacing circuits.
- Study the Architecture of 8051 microcontroller.
- Study about 8051 micro controller interfacing with various applications
- Do Assembly language programming in clear perspective

**Unit–I : 8085 Microprocessor**

Microprocessor architecture and assembly language – Organization of 8085 microprocessor – memory and I/O devices –Instructions set –data transfer, arithmetic, logic and branch operations – counters and time delays – Stack – subroutine – interrupts – simple programs.

**Unit–II : 8086 Microprocessor**

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

**Unit–III : Peripheral Devices**

8255 Programmable Peripheral Interface – 8253 Programmable Interval Timer – 8559 Programmable Interrupt Controller – Direct Memory Access (DMA) and 8257 DMA Controller – 8279 Programmable Keyboard Display Interface – 8251 and serial I/O and Data Communication.

**Unit–IV : 8051 Architecture**

Architecture of 8051 –Special Function Registers -I/O Ports – Memory Organization - Addressing modes - Instruction set – Assembly Language Programming – Assembly Code for Arithmetic and Logic Operations.

**Unit–V : Microcontroller Interfacing**

Programming 8051 Timers – Timer programming - Serial Port Programming - Interrupts Programming – LCD and Keyboard Interfacing - ADC, DAC and Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

**TEXT BOOKS**

1) Ramesh Goankar, Microprocessor Architecture Programming and Application with 8085/8080a, 6th Edition Penram International Publishing (India), 2013.
2) Kenneth J. Ayalar, "The 8051 Microcontroller Architecture Programming and Applications", Fourth Edition, Thomson,2005.

**REFERENCE BOOKS**

1) Yu-Cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.
2) Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.
3) Muhammad Ali Mazidi, Janice GillispieMazidi, "8051 Microcontroller and Embedded Systems", Second Edition PHI, 2014.
4) N Senthil Kumar, M. Saravanan and S. Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2010.

**COURSE OUTCOMES**

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

1) Understand the architecture of 8085 and 8086 microprocessor.
2) Acquire knowledge on Peripheral Devices.
3) Understand the architecture of 8051 microcontroller based systems.
4) Able to write simple programs on Programming of 8085 and 8086 microprocessor and 8051 microcontrollers.
5) Understand the Interfacing of 8051 microcontroller for various applications.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | | ✓ | ✓ | | | | | | | |
| CO3 | | ✓ | ✓ | | | | | | | |
| CO4 | | | ✓ | ✓ | ✓ | | | | | |
| CO5 | | ✓ | ✓ | ✓ | ✓ | | | | | |

| 10PC504 | DIGITAL SIGNAL PROCESSING | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To study DFT and its computation
- To study the design structures of digital filters and Z-transform
- To study the design of Digital IIR filters
- To study the design of Digital FIR filters
- To study the fundamentals of digital signal processors.

**Unit–I : Discrete Fourier Transform**

Discrete Signals and Systems – A Review – Introduction to Discrete Fourier transform (DFT) –Properties of DFT –Circular convolution – Comparison between Linear convolution and Circular convolution – Fast Convolution Procedures - Overlap-save method, Overlap-add method – Fast Fourier Transform (FFT): Decimation-in-time (DIT) algorithm – Decimation-in-frequency algorithm – FFT radix-2 DIT, DIF implementation — IDFT using Direct FFT Algorithm.

**Unit–II : Design of Digital IIR Filters**

Design of IIR filters: Analog filter approximation, Butterworth, Chebyshev and Elliptic filters – Frequency band transformation – Digital filter design equations low pass, high pass, bans pass and band stop – Impulse Invariant technique for IIR filter – Impulse Invariant pole mapping – Bilinear transformation – Bilinear transformation pole mapping.

**Unit–III : Design of Digital FIR Filters**

Structure of FIR filters - Linear Phase FIR digital Filters – Minimizing design criteria (Fourier design technique) – Filter design using Windowing technique (Rectangular, Hamming, Hanning Window) – Kaisar Window.

**Unit–IV : Digital Filter Structures**

Definition of digital filters – Properties of digital filters – Z transform - Definition –Properties – ROC – Transfer function – Poles and Zeros – Z-Transforms and Frequency response relationships – Inverse Z-Transform – Realization of digital filters- direct form- Transposed form – Canonic – Cascade- Parallel and Ladder form - Quantization noise introduced by analog-to-digital conversion – Finite register length effects in the realization of IIR and FIR digital filters and in DFT computation.

**Unit–V : Digital Signal Processors**

Generic DSP Architecture – Architecture of TMS 320C5X and TEXAS 5416 processor – memory and I/O Organization – CPU –Program control – Addressing modes – Assembly Language Instructions – On chip peripherals – Clock, watch dog and real time Interrupt, event manager units – Interface units – Simple Programs.

**TEXT BOOKS**

1) Proakis, J.G., Manolakis, D.G., "Digital Processing" Principles, Algorithms and Applications, Fourth Edition, Prentice Hall of India, 2007.
2) Ramesh Babuand C. Durai, "Digital Signal Processing", Laxmi Publications, 2005.

**REFERENCE BOOKS**

1) Mitra S.K., "Digital Signal Processing – A Computer Based Approach, Second Edition", Tata McGraw Hill, 2000.
2) Oppenheim A. Vand Schaffer, R.W., "Digital Signal Processing", Prentice Hall, 1st Edition, 2015.
3) Johnson, J.R., "Introduction to Digital Signal Processing", Prentice Hall of India, New Delhi, 1994.
4) Venkatramani, B., and Bhaskar. M., "Digital Signal Processors", TMH, 2002.

**COURSE OUTCOMES**

The students will be able to understand the

1) Computation procedures for DFT using FFT algorithms
2) Analysis and design of FIR and IIR filters
3) Finite word length effects in filter design
4) DSP Processor Architecture and Programming.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | ✓ | |
| CO2 | | ✓ | ✓ | | | | | | ✓ | |
| CO3 | | ✓ | ✓ | | | | | | | |
| CO4 | | ✓ | ✓ | ✓ | | | | | ✓ | ✓ |

| 10CP507 | COMMUNICATION LAB | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

- To investigate various analog modulation and demodulation circuits.
- To study and verify sampling theorem.
- To understand various pulse modulation techniques.
- To experimentally study characteristics of filter circuits.

**LIST OF EXPERIMENTS**

1) Amplitude Modulation and Demodulation.
2) DSB-SC Modulation and Demodulation.
3) SSB-SC Modulation and Demodulation.
4) Frequency Modulation and Demodulation.
5) Pre-emphasis and De-emphasis circuits.
6) Verification of Sampling Theorem.
7) Generation and Detection of PAM, PWM and PPM signals.
8) Frequency Division Multiplexing.
9) Design of Active filters (LPF, HPF) using Op-amp.
10) Design of Active filters (BPF, BEF) using Op-amp
11) Study of PLL.
12) Study of Receiver characteristics.

**COURSE OUTCOMES**

Upon successful completion of this course, the students will be able to

1) Demonstrate various analog modulation and demodulation circuits.
2) Construct filter circuits for Receivers and able to analyze Receiver characteristics.
3) Demonstrate Various Pulse modulation and Demodulation circuits.
4) Understand sampling process and multiplexing concepts.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | | | | | |
| CO3 | ✓ | ✓ | | | | | | | | |
| CO4 | ✓ | | | | | | | | | |

| 10CP508 | MICROPROCESSORS AND MICRO CONTROLLERS LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To study programming concepts of microprocessors and controllers using assembly language program.
- To study various peripheral IC interfacing and programming.

**LIST OF EXPERIMENTS**

1) Simple programs for sorting given set of numbers in ascending and descending order.
2) Arithmetic operations using 8085 Microprocessor.
3) Arithmetic operations using 8086 Microprocessor.
4) Study of Programmable Peripheral Interface 8255.
5) Study of Programmable Timer 8253.

6) Study of Serial Data Transfer Using 8251 USART.
7) Study of Programmable Interrupt Controller 8259.
8) Waveform generation using two channel 8-bit DAC0800.
9) Interfacing 0809ADC to 8085 Processor.
10) Interfacing of Stepper Motor to 8085 Processor.
11) Study of 8051 microcontroller and interfacing Seven Segment LED Display
12) Study of 8097 microcontroller and interfacing DAC and ADC in 8097microcontroller.
13) Study of Microcontroller PIC 16F877 and its applications.
14) Code Conversion Programs using 8051 Controller.

**COURSE OUTCOMES**

Upon completion of the course, the students will be able to

1) Understand the instruction sets of microprocessors and controllers to write assembly code for Data handling and arithmetic and logic operations.
2) Interface and Program various peripheral ICs.
3) Able to program microprocessor and Micro controllers for Real time applications.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | ✓ | | | | | | |
| CO2 | | ✓ | | ✓ | | | | | | |
| CO3 | | ✓ | | ✓ | | | | | | |

**SIXTH SEMESTER**

| 10 PC601 | DIGITAL COMMUNICATION SYSTEMS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To detail about different means of base band digital transmission.
- To familiarize the students about the types of digital band pass transmission.
- To provide basic knowledge about the use of various channel coding techniques.
- To illustrate the concepts of synchronization and Equalization techniques.
- To understand spread spectrum techniques

**Unit–I : Baseband Transmission and Reception**

Low Pass Sampling – Aliasing – Signal Reconstruction – Quantization – Quantization Noise – Companding – PCM –Line Coding – Correlative Coding – DPCM –DM –ADM – Detection of Signals in Gaussian Noise – Matched Filter – BER of Binary Signalling – Synchronisation – Frequency, Receiver, Symbol and Frame Synchronisation

**Unit–II : Inter symbol Interference and Equalization**

Inter Symbol Interference – Pulse Shaping to Reduce ISI – Two Types of Error – Performance Degradation – Detection of Shaped Pulses – Equalization – Channel

Characterization – Eye Pattern – Equalization Filter Types – Preset and Adaptive Equalization – Filter Update Rate

**Unit–III : Band pass Signalling**

Digital Band Pass Modulation Techniques - ASK, FSK, PSK, DPSK, QPSK, QAM - Detection of Signals in Gaussian Noise – Coherent and Non Coherent Detection – BER of ASK, FSK, PSK, DPSK, QPSK, QAM – M-Ary Signalling And Performance.

**Unit–IV : Channel Coding**

Linear Block Codes, Error Detection And Correcting Capability - Cyclic Codes – Convolution Codes, Maximum Likelihood Decoding, Viterbi Decoding.

**Unit–V : Spread Spectrum Techniques**

Spread Spectrum - PN Sequences, Direct Sequence and Frequency Hopping Spread Spectrum Systems, Synchronisation in Spread Spectrum Techniques - Multiple Access Techniques – FDMA – TDMA- CDMA – SDMA.

**TEXT BOOKS**

1) Bernard Sklar, "Digital Communication", 2nd Edition, Prentice Hall, Upper Saddle River, NJ, 2001.
2) Simon Haykin, "Digital Communications", 4th Edition, John Wiley and Sons, 2016.

**REFERENCE BOOKS**

1) Tauband Schilling, "Principles of Communication systems", 4th Edition, Tata McGraw Hill Co. India, 2015.
2) Bruce Carlson, "Principles of Digital Communication", McGraw Hill 5th Edition 2009.
3) Ziemer R.F. and Tramer, W.H., "Principles of Communication", Jaico Publishing House 1st Edition, 2000.

**COURSE OUTCOMES**

At the end of the course students will be able to

1) Explain different means of base band and band pass digital transmission.
2) Apply various channel coding techniques for data transmission.
3) Illustrate the concepts of synchronization and Equalization techniques.
4) Understand spread spectrum techniques.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | | | | | |
| CO3 | ✓ | ✓ | | | | | | | ✓ | |
| CO4 | ✓ | ✓ | | | | | | | | |

| 10PC602 | ANTENNA AND WAVE PROPAGATION | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To introduce the base platform of antenna design.
- To familiarize the students with antenna terminologies.
- To make the students comprehend the design of various antenna arrays.
- To encapsulate the key topics of standard antennas, special types of antennas.
- To elucidate the various propagation techniques of waves.
- To teach the students the various antenna measurement techniques.

**Unit–I : Antenna Fundamentals**

Retarded Potential, Radiation From a Current Element - The Short, Monopole and Half Wave Dipoles, Power Density, Directivity and Gain, Radiation Resistance, Input Impedance, Radiation Patterns, Beam Width, Bandwidth and Polarization - Reciprocity Theorem - Effective Aperture Dipole and Aperture Antennas.

**Unit–II : Linear and Array Antennas**

Current Distribution - Radiation Field of Centre Fed Dipole - Near and Far Fields of Dipole Antennas, Fields for Small Loop Antennas and its Applications. Arrays of Two Point Sources - Linear Arrays with Uniform Current Distribution - Broad Side and End Fire Arrays, Binomial Array - Principle of Pattern Multiplication - Effect of Earth on Radiation Pattern - Introduction to Planar Phased And Adaptive Arrays.

**Unit–III : Special Purpose Antennas**

(Qualitative Treatment Only) Loop Antennas, Folded Dipoles, Travelling Wave Antennas, V And Rhombic Antennas, Horn Antennas, Reflector Antennas, Parasitic Elements And Yagi Arrays, Wideband Antennas, Log Periodic Antennas. Babinet's Principle - Slot Radiators, Parabolic Reflectors - Radiation Pattern, Aperture Distributions and Efficiencies - Feeding Techniques for Parabolic Antennas.

**Unit–IV : Propagation**

Factors Involved in The Propagation Of Radio Waves, The Ground Wave, Reflection of Radio Waves by The Surface of The Earth, Space Wave Propagation, Considerations in Space Wave Propagation, Atmospheric Effect in Space Wave Propagation, Ionosphere and its Effect on Radio Waves, Mechanism of Ionospheric Propagation, Refraction and Reflection of Sky Wave by the Ionosphere, Ray Paths, Skip Distance, Maximum Usable Frequency, Fading of Signal, Selective Fading - Diversity Reception.

**Unit–V : Measurements**

Impedance, Field Pattern and Gain of Antennas, Radiation Pattern, Ionospheric Measurements - Vertical Incidence Measurements of the Ionosphere, Relation between Oblique and Vertical Incidence Transmission.

**TEXT BOOKS**

1) Prasad K.D., "Antenna and Wave Propagation", Satya Prakasham, 2001.
2) Kraus J.D., "Antennas", 4th Edition, McGraw Hill, 2013.

**REFERENCE BOOKS**


1) Collins R.F., "Antenna and Radio wave propagation", McGraw Hill, 3rd Edition.
2) Stutzman, W.L. and Thile, G.A., "Antenna theory and Designer", Wiley, 1995.
3) Freman R.L., "Reference Manual for Telecommunication Engineers", Wiley, 1992.
4) Constantine A. Balanis, "Antenna Theory: Analysis and Design", 3rd Edition, Wiley, 1997.


**COURSE OUTCOMES**

Upon completion of these course, the students

1) Shall gain knowledge related to the engineering aspects of antennas, understand the various antenna terminologies and mathematics of analyzing the same
2) Have potentiality to design various antenna arrays by means of improved problem analysis skills
3) Are familiar with different types of antennas right from wired type to Microwave antennas
4) Could understand the propagating mechanism of EM waves
5) Shall know the various measurements one should carry out to ensure the proper working of the designed antennas.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ |
| CO3 | ✓ | ✓ | | | | | | | | |
| CO4 | ✓ | ✓ | | | | | | | ✓ | |
| CO5 | | ✓ | ✓ | | | | | | | |

| 10CP607 | DIGITAL COMMUNICATION LAB | L | T | P |
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**COURSE OBJECTIVES**

- To experimentally study various baseband and bandpass digital modulations.
- To understand data coding and error control coding techniques.
- To use MATLAB software in simulation and performance analysis of digital modulation techniques.

**LIST OF EXPERIMENTS**

1) Pulse Code modulation and demodulation.
2) Delta modulation and demodulation.
3) Adaptive Delta modulation.
4) Companding.
5) Sigma delta modulation and demodulation.
6) Time division multiplexing and Demultiplexing.

7) Data coding and decoding techniques for Return to Zero format and Multilevel Binary Format.
8) Data coding and decoding techniques for Phase Encoded Format.
9) ASK, FSK,PSK modulation and demodulation.
10) QPSK modulation and demodulation.
11) Synchronization techniques in PCM.
12) DPSK modulation and demodulation using MATLAB.
13) QAM modulation and demodulation using MATLAB.
14) Performance Analysis of ASK, FSK, PSK modulation schemes.
15) Error control coding techniques using MATLAB.

**COURSE OUTCOMES**

Upon completion of this course, the students will be able to

1) Demonstrate various digital base band and pass band modulation techniques.
2) Verify data coding and error control coding techniques.
3) Understand various synchronization techniques used in digital communication.
4) Use MATLAB software for the analysis and implementation of digital modulation techniques.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | | | | | ✓ | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | ✓ | ✓ | | | | | | | | |
| CO4 | | ✓ | | ✓ | ✓ | | | | | ✓ |

| 10CP608 | SIGNAL PROCESSING LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To realize arithmetic, logical, data transfer and convolution operations on DSP processors using assembly code.
- To Design digital filters using DSP processors.
- To Develop simple algorithms for signal processing and test them using MATLAB.
- To analyze and design LTI-Digital systems using MATLAB.

**LIST OF EXPERIMENTS**

1) Perform the given Arithmetic Operations and Data Transfer using TMS320C50
2) Obtain the Linear and Circular Convolution using TMS320C50
3) Design of II R and FIR filter using TMS320C50
4) Waveform Generation Using TMS320C50
5) Perform the arithmetic and logical operations using TMS320C5416 and TMS320F6713.
6) Generation and Simple Operations of Signals Using MATLAB

7) Determine the Impulse Response and Step Response of a Causal LTI System
8) Frequency Response of First Order and Second Order System using MATLAB
9) Obtain the Convolution and Correlation of the given sequence using MATLAB
10) 10. Design of IIR Filters using MATLAB
11) Design of FIR using Windowing Techniques using MATLAB
12) Simple Operations on Images using MATLAB.

**COURSE OUTCOMES**

Upon completion of this course, the students will be able to

1) Experiment concepts of Digital Signal processing and its applications using MATLAB.
2) Understand programming concepts of TMS320C50, TMS320C5416 and TMS320F6713 processors.
3) Develop digital filters using MATLAB and DSP processors.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | | ✓ | | | ✓ | | |
| CO2 | | ✓ | | | ✓ | | | | | ✓ |
| CO3 | | ✓ | ✓ | | ✓ | | | | | |

**SEVENTH SEMESTER**

| 00HS701 | ENGINEERING ETHICS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To understand the moral and ethical dimensions in engineering
- To take balanced decisions.

**Unit–I**

Senses of Engineering Ethics – Verity of Moral Issues – Types of Inquiry – Moral Dilemmas -Moral Autonomy – Kohlberg's Theory - Gilligan's Theory – Consensus and Controversy – Professions and Professionalism – Professional Ideas And Virtues - Uses of Ethical Theories.

**Unit–II**

Engineering As Experimentation - Engineering As Responsible Experiments – Research Ethics – Code of Ethics – Industrial Standers - A Balanced Outlook Law-The Challenger Case Study.

**Unit–III**

Safety And Risk - Assessment of Safety And Risk – Risk Benefit Analysis - - Red fucing Risk – The Government Regulator's Approach to Risk – Chernobyl Case Studies and Bhopal

**Unit–IV**

Collegiality and Loyalty - Respect for Authority – Collective Bargaining – Confidently – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

**Unit–V**

Multinational Corporation - Business Ethics – Environmental Ethics – Computer Ethics – Role in Technological Development - Weapons Developments – Engineering as Managers – Consulting Engineers - Engineers as Expert Witness and Advisors – Honesty – Moral Leadership - Sample Code of Conduct.

**TEXT BOOKS**

1) Govindarajan, M., Natarajan. S. and Senthilkumar. V.S., "Professional Ethics and Human Values", PHI Learning, New Delhi, 2013.
2) Mike Mertin and Roland Schinzinger, "Ethics Engineering", McGraw Hill, New Yark, - Fourth Edition, 2005.

**REFERENCE BOOKS**

1) Charles E. Harries, Michael S. Pritchard and Michael J. Rabins, "Enghineering Ethics – Concepts and Cases", Thompson Learning, Fourth Edition, 2004.
2) Charles D. Fleddermann, "Engineering Ethics", Parantice Hall, New Mexico, 1999.
3) John R. Boatright, "Ethics and the Conduct of Business", Pearson Education,- 2003.
4) Edmund G. Seebauer and Robert L. Barry, "Fundamentals of Ethics for Scientsts and Engineers", Oxford Universty Press, 2001.
5) David Ermann and Michele S. Shauf, "Computers, Ethics and Society", Oxford University Press, Third Edition, 2003.

**COURSE OUTCOMES**

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

1) Understand the relationship between the Engineer and the Society
2) Learn the importance of codes in engineering practice
3) Acquire knowledge on the legal, moral and ethical aspects in Engineering

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | | | | ✓ | | ✓ | ✓ | | | ✓ |
| CO2 | | | | | | ✓ | ✓ | ✓ | | ✓ |
| CO3 | | | | | | | ✓ | | | ✓ |

| 10PC702 | MICROWAVE ENGINEERING | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To impart the essential knowledge to the students to learn about the Microwave generators working with different kinds of Microwave Components.
- To enhance the students proficiency about microwave solid state devices and deriving scattering matrix.
- To provide sufficient Information about Noise analysis in Microwave Engineering.
- To accomplish a thorough idea about direct and indirect Microwave parameter measurements.

**Unit–I : Microwave Linear Beam Tubes**

Construction - Operation of Two Cavity Klystron Amplifier- Power Output and Efficiency Consideration-Multi Cavity Klystron Amplifier -Single Cavity Reflex Klystron Oscillator- Mode Characteristics - Power Output and Efficiency Consideration-Slow Wave Structure-Travelling Wave Tube (TWT)-Comparison of TWT and Klystron-Backward Wave Oscillator (BWO).

**Unit–II : Microwave Crossed-Field Tube and Solid State Devices**

Construction – Operation of Magnetron Oscillator, Hull Cut-Off Condition-Principles of Gunn Effect, Operation of Gunn Diode Oscillator and its Applications-Principles and Operation of IMPATT,TRAPATT, Parametric Amplifier.

**Unit–III : Microwave Devices**

Active Devices – Pi Equivalent Model of Radio Frequency Junction Transistors and Field Effect Transistors – Degeneration Circuits – Current Sinks -Micro Wave Hybrid Tees, E-Plane, H-Plane, E-H Plane Tees and its Application-Hybrid Ring-Directional Coupler – Attenuators-Phase Changers-Matched Termination-Corner, Bend, Twister-Slotted Section - Microwave Propagation in Ferrites, Faraday Rotation, Ferrite Devices, Gyrator, Isolator and Circulator.

**Unit–IV : S Parameter**

Scattering Parameter, Properties of S-Matrix, Shifting of Reference Plane in Two Port Network, Losses in Microwave Circuits- Insertion Loss, Transmission Loss, Return Loss, Reflection Loss, Conversion Between ABCD And S Parameter, S-Matrix of Some Two Port Networks- Multi Port Networks.

**Unit–V : Microwave Measurements and Noise Analysis**

Measurement of Voltage Stranding Wave Ratio, Double – Minimum Method - Measurement of Frequency, Wave Length, Attenuation, Power, Impedance-Measurement of Antenna Radiation Pattern- Measurement of Antenna Gain-Measurement of Beam Width – VSWR

**TEXT BOOKS**

1) Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd Edition, PHI, 2005.
2) Kulkarni, M., “Microwave and Radar Engineering”, 3rd Edition, Umesh Publications, 2008.

**REFERENCE BOOKS**

1) David, Pozar, M., “Microwave Engineering”, 4th Edition, John Wiley and Sons, 2008.

2) Collins, R.E., "Foundation of Microwave Engineering", McGraw Hill, 3rd Edition 2005.
3) Annapurna Das, "Microwave Engineering", TMH, 2nd Edition, 2006.
4) Sharma, K.K., "Fundamental of Micro and Radar Engineering", S. Chand and Co., New Delhi, 2011.
5) Herbert Reich. J., Skolnik. J.G., Ordung. P.F. and Krauss. H.L., "Microwave Principles", Distributors, C.B.S Publishers, New Delhi, 2004.

**COURSE OUTCOMES**

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

1) Understand the working principles of Microwave Solid and Non solid state devices.
2) Analysis of the characteristics and behavior of Microwave Networks and components.
3) Measurement concepts in Microwave Engineering.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | ✓ | ✓ |
| CO2 | ✓ | ✓ | | | | | | | ✓ | |
| CO3 | ✓ | ✓ | | ✓ | | | | | | |

| 10CP706 | MICROWAVE LAB | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

- To Study the characteristics of microwave sources and microwave components.
- To Study the radiation characteristics of Horn and parabolic antennas.
- To study microwave measurements.

**LIST OF EXPERIMENTS**

1) Study of Microwave Components
2) VI Characteristics and Frequency Response of Gunn Oscillator
3) Mode Characteristics of Reflex Klystron Oscillator
4) Measurement of Attenuation, VSWR, Wave Length and Operating Frequency using Microwave Test bench
5) Characteristics of E, H and Magic Tee Plane using Microwave Test bench
6) Characteristics of Circulator using Reflex Klystron Oscillator
7) Measurement of Radiation Characteristics of Horn.
8) Measurement of Radiation Characteristics of Parabolic antenna
9) Characteristics of Directional Coupler 3dB and 20dB using Microwave Test bench
10) Measurement of Unknown Impedance of Pyramidal Antenna using Gunn oscillator
11) Measurement of Dielectric Constant for the given solid using Microwave Test bench.

**COURSE OUTCOMES**

At the end of the course students will be able to

1) Demonstrate characteristics of Microwave sources and components.
2) Analyze radiation pattern for Microwave antennas.
3) Measure Unknown impedance, Microwave power, attenuation and VSWR using appropriate bench setup.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | ✓ | | | ✓ | | |
| CO2 | | ✓ | ✓ | | | | | | | |
| CO3 | ✓ | ✓ | | | ✓ | | | | | |

# PROFESSIONAL ELECTIVES

## PE – PROFESSIONAL ELECTIVES

1) Data Structures and C++
2) Java Programming
3) Control Systems
4) Digital Image Processing
5) VLSI Design
6) Fiber Optic Communication
7) Radar and Navigational Aids
8) Satellite Communication
9) Wireless Communication
10) Information Theory and Coding
11) DSP Processor Architecture and Programming
12) Mobile Adhoc Networks
13) Modern Communication Systems
14) Telecommunication Switching and Networks
15) Wavelets and Applications
16) Data Communication
17) Multimedia Compression Technology
18) Embedded Systems
19) Biomedical Signal Processing
20) Electronic Measurements and Instrumentations.

| 10PEXX | DATA STRUCTURES AND C++ | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To learn the methodical way of solving complex problems
- To understand the different methods of organizing large amounts of data
- To efficiently implement graphical programs
- To learn and develop skills in C++ programming

**Unit–I : Linear Data Structures**

Introduction to data structures, Primitive and non-primitive data structures, Arrays in C -types, Structures in C, Stack-implementation, operations, Queues-operations-Lists-Linked list-types, Applications.

**Unit–II : Non Linear Data Structures**

Tree - Binary tree-representation - Tree traversal techniques- Graph-representation, traversal-Sorting- Selection Sorting, Insertion sorting, Merge sorting, Radix sorting, Searching -techniques - Hashing.

**Unit–III : Object Oriented Programming**

Object Oriented Programming concepts- Objects- classes – methods and message passing, encapsulation, abstraction, inheritance, polymorphism and dynamic binding-characteristics of OOPS-benefits of object orientation. Introduction to C++ and data types-Operators in C++.

**Unit–IV : Objects and Classes**

Objects and class -defining a class –defining member functions-Private and public member function–accessing class members, creating objects, object as function arguments- Array fundamentals - array within a class - array of objects. Constructors and destructors- Function overloading - Inline function - Virtual function.

**Unit–V : File and Graphics Operations**

Operator overloading – overloading unary, binary and relational operators-type conversion, Inheritance- derived class and base class-visibility mode-public, private and protected–various forms of inheritance. C++ graphics - text mode graphics functions- graphics mode graphics functions - colors –drawing shapes- Address and pointers-Files and streams.

**TEXT BOOKS**

1) John R. Hubbard, "Programming with C++", Tata McGraw Hill, New Delhi, 1988.
2) Aho Alfred, V., E. Hopperoft John, D. UIlman Jeffrey, “Data Structures and Algorithms”, Addison Wesley, 1987.

**REFERENCE BOOKS**

1) Jean - Paul Tremblay and Paul Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill, 1988.
2) R.F. Gilberg, B.A. Forouzan, “Data structures”, Second Edition, Thomson India Edition, 2005
3) Michael T. Goodrich, “Data Structures and Algorithm Analysis in C++”, Wiley student edition, 2007.

4) Sahni, "Data Structures Using C++", The McGraw Hill, 2006.
5) E. Balagurusamy, "Object Oriented Programming with C++", 4th Edition, Tata McGraw Hill.

**COURSE OUTCOMES**

1) Understand basic data structures such as arrays, linked lists, stacks and queues in C.
2) Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data in C and C++.
3) Able to use object oriented programming language like C++ and associated libraries to develop object oriented programs.
4) Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | ✓ | ✓ | | | | ✓ | |
| CO2 | ✓ | | ✓ | ✓ | ✓ | | | | | |
| CO3 | ✓ | ✓ | ✓ | | ✓ | | | | | ✓ |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | |

| 10PEXX | JAVA PROGRAMMING | L | T | P |
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**COURSE OBJECTIVES**

- To understand the concepts of object-oriented, event driven, and concurrent
- Programming paradigms and develop skills in using these paradigms using Java.

**Unit–I : Introduction to OOP'S**

Object Oriented Programming Concepts: Objects – Classes – Methods and Messages –Abstraction and Encapsulation – Inheritance – Abstract Classes – Polymorphism – Objects and Classes in Java – Defining Classes – Methods - Access Specifiers – Static Members –constructors – Finalize Method.

**Unit–II : Java Program Structure**

Arrays – Strings - Packages – Java-Doc comments – Class Hierarchy – Polymorphism – Dynamic Binding – Final Keyword – Abstract Classes.

**Unit–III : Objects, Classes and Graphics**

The Object Class: Reflection – Interfaces – Object Cloning – Inner Classes – Proxies - I/O Streams - Graphics Programming – Frame – Components – Working With 2D Shapes.

**Unit–IV : Java Event Handling**

Event: Driven Programming in Java Event- Handling Process, Event Handling Mechanism, Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.

**Unit–V : Java Database Connectivity and Web Applications**

Introduction to JDBC-JDBC Drivers and Architecture, CURD Operation Using JDBC, Connecting to Non-Conventional Databases. Web Application Basics -

Architecture and challenges of Web Application, Introduction to Servlet- Servlet Life Cycle.

**TEXT BOOKS**

1) Cay S. Horstmann and Gary Cornell, "Core Java: Volume-I – Fundamentals", Tenth Edition, Prentice Hall, 2016.
2) E. Balagurusamy", Java Programming", Third Edition, 2007.

**REFERENCE BOOKS**

1) K. Arnold and J. Gosling, "The JAVA Programming Language", Fourth Edition, Pearson Education, 2006.
2) Timothy Budd, "Understanding Object-oriented Programming with Java", Updated Edition, Pearson Education, 2000.
3) C. Thomas Wu, "An introduction to Object-oriented Programming with Java", Fifth Edition, Tata McGraw Hill Publishing company Ltd., 2010.

**COURSE OUTCOMES**

Upon completion of the course the students will be able to

1) Understand the format and use of objects.
2) Understand basic input/output methods and their use.
3) Understand object inheritance and its use.
4) Understand development of JAVA applets vs. JAVA application

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | ✓ | |
| CO2 | | ✓ | | ✓ | ✓ | | | | | |
| CO3 | ✓ | ✓ | | ✓ | ✓ | | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | |

| 10PEXX | CONTROL SYSTEMS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- Modeling of translational and rotational system, block diagram reduction techniques and Signal flow graph for obtaining transfer function.
- Transient analysis of various standard inputs for first order and second order system.
- Frequency response analysis and frequency domain specification by bode plot and polar plot.
- Stability analysis by Routh -Hurwitz criterion and Nyquist stability criterion.
- Analysis of sampled data control system using Z-transform.
- State space analysis (writing state equation for physical, phase, canonical variables.)
- Concept of controllability and observability

**Unit–I : System Modelling**

Introduction to Control System -Basic Elements in Control Systems - Open Loop and Closed Loop Systems - Differential Equation Representation of Physical

Systems - Transfer Function – Mathematical Modeling of Electrical and Mechanical Systems (Translational and Rotational Systems)-Block Diagram Representation of a System - Block Diagram Reduction Techniques - Signal Flow Graph.

**Unit–II : Time Domain Analysis**

Standard Test Signals - Analysis of I Order and II Order Systems - Time Domain Specifications - Steady State Error - Generalized Error Co-Efficients – Effect of Adding Zero to System-P, PI, PD, and PID Compensation-Stability Analysis - Routh Hurwitz Criterion - Nyquist Stability Criterion -Root Locus Technique.

**Unit–III : Frequency Domain Analysis**

Frequency Response - Frequency Domain Specifications –Correlation Between Frequency and Time Domain Specifications- Gain and Phase Margin-Bode Plot – Polar Plot -Constant M and N Circles -Nichols Chart-Series and Parallel Compensators-Lead, Lag, Lead and Lag Compensators.

**Unit–IV : Digital Control Systems**

Introduction - Basic Digital Control System - Sampling - Sample And Hold Circuits –Open and Closed Loop Sampled Data System- Discrete Time Signal - Linear Discrete Time Signal - Pulse Transfer Functions - Z Transform Analysis Sampled Data Control Systems -Stability Analysis - Jury's Stability Criterion.

**Unit–V : State Space Analysis**

Introduction - State Space Formulation - State Space Representation of Continuous and Discrete Time Systems - State Diagram - State Space Representation Using Physical, Phase and Canonical Variables –Diagonal Canonical Form-Jordon Canonical Form Diagonalization- Concept of Controllability and Observability.

**TEXT BOOKS**

1) Nagrath J. and Gopal M., “Control System Engineering”, New Age International (p) Ltd., 5th Edition, 2008.
2) Gopal M., “Digital Control and State Variable Methods”, Tata McGraw Hill Education, 2003.

**REFERENCE BOOKS**

1) Ogata K., “Modern Control Engineering”, 5thEdition, Prentice Hall, 2010.
2) Kuo, B.C., “Digital Control Systems”, 2nd Edition, Oxford University Press, 2002.
3) R. Anandhanatarajan, P. Rameshbabu, “Control System Engineering, Sci Tech Publication Pvt. Ltd., 2013.
4) Kuo, B.C., “Automatic Control Systems”, John Wiley, 9th Edition, 2003.

**COURSE OUTCOMES**

After completion of the subject, students able to get a knowledge in various aspects of

1) Mathematical models for such electrical and mechanical systems.
2) Equivalent state space model for given system.
3) Time and Frequency domain analysis with response to test inputs

| Mapping with Programme Outcomes(POs) | |
|---|---|
| **Course** | **Programme Outcomes** |

| Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO2 | ✓ | | ✓ | ✓ | | | | | ✓ | |
| CO3 | ✓ | | | ✓ | | | | | ✓ | |

| 10PEXX | DIGITAL IMAGE PROCESSING | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

To impart knowledge on digital image fundamentals and image transformers, image enhancement, image restoration, image encoding and image segmentation. The student should be made to

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Be familiar with image compression and segmentation techniques.
- Learn to represent image in form of features.

**Unit–I : Image Transforms**

Introduction - Elements of Digital Image Processing Systems - Structure of the Human Eye - Image Formation - Contrast sensitivity - Sampling and Quantizations - Neighbours of a Pixel - Distance Measures - Color image fundamentals.

Fourier Transform - DFT Properties of Two Dimensional FFT, Separability, Translation, Periodicity, Rotation, Average Value - FFT Algorithm – Radan Transform - Walsh Transform - Hadamard Transform - Discrete Cosine Transform.

**Unit–II : Image Enhancement**

Definition - Spatial Domain Methods - Frequency Domain Methods - Histogram Modification Technique - Neighborhood Averaging - Median Filtering - Low Pass filtering - Image Sharpening - High Pass Filtering.

**Unit–III : Image Restoration and Segmentation**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering. Segmentation - Detection of Discontinuities–Edge Linking and Boundary Detection – Region Based Segmentation-Morphological processing- Erosion and Dilation.

**Unit–IV : Wavelets and Image Compression**

Wavelets – Subband Coding - Multiresolution expansions - Compression - Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

**Unit–V : Image Representation and Recognition**

Boundary representation – Chain Code – Polygonal Approximation, Signature, Boundary segments – Boundary Description – Shape Number – Fourier Descriptor, Moments- Regional Descriptors –Topological feature, Texture - Patterns and Pattern classes - Recognition Based on Matching.

**TEXT BOOKS**

1) Refael C. Gonzalez, Richard. E. Woods, Paul Wintz, "Digital Image Processing", Third Edition, Pearson Education., 2011.
2) Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall, 1989.

**REFERENCE BOOKS**

1) Rosenfeld A., Kak, A.C., "Digital Image Processing", Academic Press, 1979.
2) William K. Pratt, "Digital Image Processing", John Wiley and Sons, 4th Edition, Wiley, 2007.

**COURSE OUTCOMES**

Upon successful completion of this course, students will be able to

1) Understand digital image fundamentals.
2) Apply image enhancement and restoration techniques.
3) Use image compression and segmentation Techniques.
4) Represent features of images.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | | ✓ | ✓ | ✓ | | | | | |
| CO3 | ✓ | | ✓ | ✓ | ✓ | | | | | |
| CO4 | ✓ | ✓ | | ✓ | ✓ | | | | | |

| 10PEXX | VLSI DESIGN | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

The course intends to provide an understanding of VLSI Design process and to bring both system and circuit view on design together.

- To study the Characteristics of MOS, CMOS transistors.
- To learn transistor level CMOS logic design.
- To understand NMOS and CMOS fabrication process, design rules.
- It offers a profound understanding of principle of operation of various Analog circuits.
- To impart knowledge about designing digital circuits like adders and multipliers.
- To study programming technologies and architectures of FPGAs, CPLDs.
- To understand the concepts of modeling a digital system using VHDL.

**Unit–I : VLSI Design Concepts**

Evolution of VLSI – VLSI Design Flow- Design Domains: Behavioral, Structural and Physical Design – Concept of Regularity, Modularity and Locality-VLSI Design Styles: Full Custom - Semi Custom Approaches.

MOS Devices and Circuits: MOS Structure- MOS Current Equation – Channel Length Modulation-Body Effect –MOSFET capacitances-CMOS Logic Design: Static Characteristics of CMOS Inverter, Dynamic Behavior of CMOS Inverter- Static and Dynamic Power Dissipation in CMOS – Basic and Complex Gates Realization in CMOS-Transistor Sizing-Interconnect Parameters- Driving Large Capacitive Loads.

**Unit–II : VLSI Fabrication Techniques**

An Overview of Wafer Fabrication, Wafer Processing – Oxidation – Patterning – Diffusion – Ion Implantation – Deposition – Silicon Gate NMOS Process – CMOS Processes – N-well, P-well- Twin Tub, Silicon on Insulator – CMOS Process Enhancements – Interconnects, Circuit elements-CMOS Latch Up and Prevention.

Design Rules-Need for Design Rules-CMOS Lambda Based Design Rules-Stick Diagram and Layout for CMOS Inverter.

**Unit–III : Analog VLSI**

Introduction to Analog VLSI - Analog Circuit Building Blocks – Switches- Active resistors - Current Sources and Sinks - Current mirrors/amplifiers –Voltage and Current References - CMOS Inverting Amplifiers - CMOS Differential Amplifiers - CMOS Two Stage op-amp - Modulators and Multipliers-Switched Capacitor Filter.

**Unit–IV : Digital VLSI**

Logic Design: Switch Logic and Gate Logic - Dynamic CMOS Logic - Structured Design Examples: Simple Combinational Logic and Clocked Sequential Design.

Sub-System Design: Design of Shifters, Design of Adders: Ripple Carry Adders, Carry Select Adder, Carry Save Adder, Manchester Carry –Chain Adder, Carry Look- Ahead Adder, Design of Multipliers: Serial, Parallel and Pipelined Multiplier Arrays, Booth Multiplier, Wallace Tree Multiplier.

**Unit–V : Programmable ASICS AND VHDL**

Architecture and Programming technologies of ROMs, EPROMs, PLA, PAL, Gate arrays, CPLD and FPGA – Xilinx FPGA's LCA, I/O block and Interconnect – Programming technology. VHDL - Hardware Modeling Issues –VHDL Code Structure: Library declaration, Entities and Architectures –Data Types- Operators-Concurrent and Sequential statements-Signals and Variables-Packages and Libraries - Introduction to Behavioral, Dataflow and Structural Modeling- Simple VHDL Code Examples.

**TEXT BOOKS**

1) Douglas A. Pucknell and Kamran Eshranghiaon. "Basic VLSI Design", Prentice Hall of India, New Delhi, Third Edition, 2005.
2) Randall L. Geiger, Phillip E. Allen, Noel R. Strader", VLSI Design Techniques for Analog and Digital Circuits", Tata McGraw Hill Edition, 2010.

**REFERENCE BOOKS**

1) Neil H.E. Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design: A Circuits and Systems Perspective", Third Edition, Pearson Edition, 2005.
2) Michael John Sebastian Smith., "Application Specific Integrated Circuits", Pearson edition, 1997.
3) John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley & Sons Inc., 2003.
4) S.M. Sze, "VLSI Technology", Tata McGraw Hill Edition, 2003.
5) Eugene D Fabricus., "Introduction to VLSI Design", McGraw Hill International Edition.
6) Jan Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits: A Design Perspective", Pearson Second Edition, 2005.

7) Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, Tata McGraw Hill Edition, 2002.
8) Douglas Perry, “Circuit design with VHDL”, McGraw Hill International, Third Edition, 1999.
9) Bhaskar, J,. "A VHDL Primer", PHI, 1999.

**COURSE OUTCOMES**

Upon completion of the course the students will be able to

1) Describe a VLSI Design flow for any complex digital system
2) Explain the fabrication steps in manufacturing NMOS and CMOS transistors.
3) Design CMOS circuit to realize specific logic functions and draw their symbolic layouts
4) Analyze various sub-circuits used in analog IC
5) Design and analyze digital circuits like multipliers, adders
6) Describe architecture and programming technologies of FPGA and CPLD.
7) Model a simple digital system using VHDL

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | | | | | | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | ✓ | | ✓ | | | | | | | |
| CO4 | ✓ | ✓ | | ✓ | | | | | | |
| CO5 | ✓ | ✓ | ✓ | | | | | | | |
| CO6 | ✓ | ✓ | | | | | | | ✓ | |
| CO7 | | ✓ | ✓ | ✓ | | | | | | |

| 10PEXX | FIBER OPTIC COMMUNICATION | L | T | P |
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**COURSE OBJECTIVES**

- To impart wide knowledge on optic fiber structure-wave guiding properties, materials and fabrication metals, signal degradation
- To facilitate the knowledge about optical fiber sources and transmission techniques
- To enrich the idea of optical fiber communication systems, transmitter section, medium- the optical fiber, receiver section.
- To analyze system based on important parameters for characterizing optical fiber, optical source, detector and amplifier,
- To explore the fundamentals and advances in lasers, LEDs, photodiodes, advanced optoelectronics.

**Unit–I : Optical Communication Systems**

Block diagram - Advantages - Comparison with other systems optical Fibers: Structures and wave guiding fundamentals. Basic optical laws and definitions. Optical fiber modes and configurations. Fiber types, rays and modes, Mode theory for circular waveguides. Maxwells equation, Wave equations for step index fiber and graded index, modes in step index and graded index fibers.

**Unit–II : Signal Degradation in Optical Fibers**

Fiber Materials And Fabrication Methods - Outside Vapour Phase Oxidation, Vapour Phase Axial Deposition, Modified Chemical Vapour Deposition - Double Crucible Method, Mechanical Properties, Fiber Optic Cables - Attenuation, Signal distortion, Pulse broadening, Mode-coupling.

**Unit–III : Optical Sources**

LEDs - LED Structures, Materials Internal Quantum Efficiency, Modulation Capability, Transient Response. Lasers - Laser Diode Structures and Threshold Conditions. Model Properties and Radiation Patterns. Modulation of Laser Diodes and Temperature Effects. Light Source Linearity, Model and Reflection Noise, Reliability Considerations. Power Launching and Coupling: Source-to-Fiber Power Launching. Lensing Schemes for Coupling Improvement. Fiber to Fiber Joints. Splicing Techniques. Optical Fiber Connectors.

**Unit–IV : Photo Detectors**

Physical Principles of Photodiodes. PIN Photo Detectors, Avalanche Photodiodes, Photo Detector Noise, Noise Sources, Signal-To-Noise Ratio. Detector Response Time. Avalanche Multiplication Noise. Temperature Effects on Avalanche Gain. Photodiode Materials. Optical Receiver: Fundamental Receiver Operation, Digital Receiver Performance Calculation.

**Unit–V : Optical Fiber Transmission Links**

Point to Point links, Wavelength Division Multiplexing, Data Buses, Line Coding, Application of Fiber Optic Systems in Local Area Networks. Unguided Optical Communication Systems: Transmission parameters, Sources, Detectors. Examples of Unguided Optical Communication Systems.

**TEXT BOOKS**

1) Keiser G., "Optical Fiber Communications" McGraw Hill, Fourth Edition, 2010.
2) Gower, J., "Optical Communication Systems" PHI, Second edition, Fifth Reprint, 2001.

**REFERENCE BOOKS**

1) Cheo, P.K., "Fiber Optics" Prentice Hall, 1985.
2) Takanori Okoshi, "Optical Fibers" Academic press, 2012.
3) Michael K. Barnoski, "Fundamentals of Optical Fiber Communications" Academic Press, 2012.

**COURSE OUTCOMES**

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

1) Explain the fundamentals, advantages and advances in optical communication system
2) Acquire a detailed understanding of types, basic properties and transmission characteristics of optical fibers

3) Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
4) Understand configuration and architecture of advanced optical communication, advanced system techniques and nonlinear optical effects and their applications
5) Gain the knowledge of knowledge of working and analysis of optical amplifiers and important devices / components at the transmitters (sources like Semiconductor lasers / LEDs, modulators etc) and the receivers (optical detectors etc.) of the optical communication system and their uses.
6) Analyze the transmission links and its associated parameters on system performance.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | ✓ | |
| CO2 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO3 | ✓ | ✓ | ✓ | | | | | | ✓ | |
| CO4 | ✓ | | | | | | | | | |
| CO5 | | ✓ | ✓ | ✓ | | | | | | |
| CO6 | | | | ✓ | | | | | | |

| 10PEXX | RADAR AND NAVIGATIONAL AIDS | L | T | P |
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**COURSE OBJECTIVES**

- To impart the essential knowledge to the students in the area of Radar and Navigational aids.
- To provide knowledge of about RADAR equation and conquer the knowledge of calculating object distance.
- The students are expected to acquire knowledge about concepts different types of Radar, such as CW, FMCW, MTI Radar, Tracking radar
- To provide sufficient knowledge about radar clutters & Different Navigational systems.

**Unit–I : Basic Concepts and Radar Equations**

Introduction to Radar, Basic Radar Block Diagram and Operation, Simple Form of Radar Equation - Bi- Static Radar Equation, Radar Frequencies, Applications of Radar, Merits and De- Merits of Radar.

Detection of Signals in Noise, Receiver Noise and Signal to Noise Ratio, Radar Cross Section of Targets, Pulse Repetition Frequency and Range Ambiguities, Unambiguos Range, Radar System Losses.

**Unit–II : Doppler and MTI Radar**

Doppler Effect – Simple CW Doppler Radar Block Diagram and Operation, Basis Principles and Operation of Frequency Modulated CW Radar (FMCW).

MTI Radar Block Diagram – Delay Line Cancellers – Multiple or Staggered Pulse Repetition Frequency - Digital MTI Processing, Pulse Doppler Radar.

**Unit–III : Tracking Radar**

Tracking Radar and its Types - Sequential Lobing - Block Diagram of Conical-Scan Tracking Radar. Monopulse Tracking Radar – Amplitude Comparison Monopulse Tracking – Phase Comparison Monopulse Tracking.

**Unit–IV : Radar Clutter and Basic Navigational Radar System**

Introduction to Radar Clutter – Types – Surface Clutter Radar Equations, Angel Echoes.

Introduction – Four Methods of Navigation - Radio Direction Finding – Loop Antenna - Adhoc Directional Finder- Automatic Directional Finders- VHF Omni Directional Range (VOR).

**Unit–V : Advanced Navigational System**

Hyperbolic System of Navigation – Loran (Long Range Navigation) and Decca Navigation System - DME (Distance Measurement Equipment) and TACAN (Tactical Air Navigation). Omega Navigation System - Satellite Navigation System – Navstar Global Positioning System.

**TEXT BOOKS**

1) Merrill I. Skolnik, "Introduction to Radar Systems", Third Edition, Tata McGraw Hill, 2003.
2) G.S.N. Raju, "Radar Engineering and Fundamentals of Navigational Aids", I.K International Publishing House Pvt. Ltd., 2010.

**REFERENCE BOOKS**

1) Brookener, "Radar Technology", Artech Hons, 1986.
2) Peyton Z. Peebles, "Radar Principles", John Wiley Inc., 2004.
3) Nagaraja, N.S., "Elements of Electronic Navigation", McGraw Hill Education, 2004.

**COURSE OUTCOMES**

1) Understand the concept of Radar working principles.
2) Different types of Radar and Analytical design.
3) Learn about the different types of Navigational system.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | | |
| CO2 | ✓ | ✓ | | ✓ | | ✓ | | | | |
| CO3 | ✓ | | ✓ | | | | | | | |

| 10PEXX | SATELLITE COMMUNICATION | L | T | P |
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**COURSE OBJECTIVES**

- To impart wide knowledge on satellite fundamental.
- To familiarize the functioning of different types of satellite Link Design.
- To illustrate the concepts of various Assess techniques.
- To familiarize the Laser's in satellite communication and satellite services.

**Unit–I : Satellite Fundamentals**

Satellite construction - Satellite orbit - Orbital mechanics - Equation of Orbit - Orbital element - Look Angle Determination - Limits of Visibility - Sub Satellite Point - Sun Transit Outage - Space Craft Technology - Altitude in Orbit Control - Propulsion Telemetry - Tracking And Command - Communication and antenna Subsystems - Launching Procedures - Launch Vehicles.

**Unit–II : Satellite Link Design**

Basic Transmission Theory - Satellite Uplink and Down Link - Analysis And Design - Link Budget - Performance Impairments - System Noise - Inter Modulation Interference - Propagation Characteristics And Frequency Considerations - System Reliability - Design of Life Time - Earth Station Design.

**Unit–III : Access Techniques**

Types - FDMA Concepts - Inter Modulation And Back Off - SPADE System - TDMA Concept - Frame and Burst Structure - Satellite Switch - CDMA Concept - VS and SH CDMA System - Random Multiple Access Techniques - Packet Switching - Packet Satellite Networks - Earth Station Technology - Terrestrial Interface - Receiver And Transmitter - Antenna Systems - Random Access Estimating.

**Unit–IV : Lasers in Satellite Communication**

Semi Conductor And Laser Sources - Semiconductor Laser Lifetime - Output Wavelength Control - Direct And Indirect Modulation Techniques – Radiational Effects - Acquisition And Tracking Systems - Tracking And Pointing Control Systems - Inter-Satellite Links - Laser Crosslink Analysis - Optical Communication For Satellite Networks.

**Unit–V : Satellite Services**

Packet Satellite - Fixed Satellite Services - Broadcast Satellite Services - Satellite TV Systems - Domestic Satellite Systems (INSAT, INTELSAT and INMARSAT Systems) Mobile Satellite Services - VSAT - Global Positioning Satellite Systems - Maritime Satellite Services -Gateways - ATM over Satellite - Role of Future Satellite Networks.

**TEXT BOOKS**

1) Pratt and Bostian, "Satellite Communication", John Wiley and Sons, Second Edition, 2006.
2) Tri T. Ha, "Digital Satellite Communication System", McGraw Hill.

**REFERENCE BOOKS**

1) Pritchend and Sciulli, "Satellite Communication Systems Engineering", PHI 1986.
2) Robert M. Gagliendi., "Satellite Communication", John Wiley and Sons, 1988.
3) Richharia, M., "Satellite Communication System Design and Analysis", McGraw Hill Professional, 2nd Edition, 1999.
4) Agarwal, B.N., "Design of Geo Synchronous Space Craft", Prentice Hall, 1986.

**COURSE OUTCOMES**

1) Basics of satellite communication have been discussed.
2) The basic multiple access techniques related to satellite communication have been analyzed.
3) Link design concept is used to understand about the modulations and noises.
4) Usage of laser and its importance have been analyzed.
5) Applications of the satellite services have been proposed.

| Mapping with Programme Outcomes (POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | | ✓ | | | | | | | | |
| CO3 | ✓ | ✓ | ✓ | | | | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |
| CO5 | | | | | | ✓ | ✓ | | | |

| 10PEXX | WIRELESS COMMUNICATION | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To acquire knowledge of Wireless channels and parameters
- To impart knowledge on mobile communication and cellular system architecture
- To understand various Modulation Techniques used in wireless communication.
- To create exposure to multipath mitigation techniques and wireless standards

**Unit–I : Wireless Channels**

Large Scale Path Loss – Path Loss Models- Free Space and Two-Ray Models - Link Budget Design – Small Scale Fading- Parameters of Mobile Multipath Channels – Time Dispersion Parameters-Coherence Bandwidth – Doppler Spread and Coherence Time-Fading Due to Multipath Time Delay Spread - Flat Fading, Frequency Selective Fading – Fading Due to Doppler Spread - Fast Fading , Slow Fading.

**Unit–II : Fundamentals of Cellular Communication**

Multiple access technique - FDMA, TDMA and CDMA - Operation of Cellular Systems - Frequency Reuse - Channel Assignment Strategies - Interference and System Capacity - Co-Channel Interference - Adjacent Channel Interference - Trunking and Grade of Service - Improving Coverage and Capacity in Cellular Systems - Cell Splitting - Sectoring - Repeaters for range extension - A Micro cell zone concept.

**Unit–III : Modulation Techniques**

Introduction to Modulation Techniques, Modulation and Demodulation - Quadrature Phase Shift Keying, Π / 4-Differential Quadrature Phase Shift Keying, Offset- Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power Spectrum and Error Performance In Fading Channels, OFDM Principle – Cyclic Prefix, PAPR, Inter Carrier Interference.

**Unit–IV : Multipath Mitigation Techniques**

Equalization – Adaptive Equalization, Linear and Non - Linear equalization, Zero forcing and LMS Algorithms, Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception.

**Unit–V : Mobile Communication Systems**

Overview of AMPS - DECT - CT2 - PACS - PHS - International Mobile Telecommunication 2000 - GSM Architecture - USSD - GPRS - EDGE - IS95, CDMA 2000 - WCDMA - UMTS - HSPDA - Bluetooth -WIFI - WIMAX - Introduction to LTE.

**TEXT BOOKS**

1) Rappaport, "Wireless and Mobile Communication", Pearson Education, 2009.
2) Yi-Bing Lin and Imrichchlantae., “Wireless and Mobile Network Architecture” John Wiley & Sons, 2008.

**REFERENCE BOOKS**

1) ITI Saha Misra, “Wireless Communications and Networks: 3G and Beyond”, Tata McGraw Hill Edition, 2013.
2) K. Fazel and S. Kaiser, "Multicarrier and Spread Spectrum Systems", Wiley, 2003.
3) D. Tse and P. Vishwanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
4) Lee W.C.Y., "Mobile Cellular Telecommunication Systems", McGraw Hill International Edition, 1990.
5) Andreas F. Molisch, “Wireless Communications”, John Wiley – India, 2010.
6) Ramjee Prasad," OFDM for Wireless Communications Systems", Artech House, 2004.

**COURSE OUTCOMES**

At the end of the course student will

1) Characterize Wireless Channels.
2) Explain the basic concepts of Cellular Systems.
3) Design and Implement various Modulation schemes for fading channels.
4) Compare Multipath Mitigation techniques and analyze their performance.
5) Acquire knowledge on Various Wireless Standards.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | ✓ | | ✓ | ✓ | | | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | | | | | |
| CO5 | ✓ | ✓ | | | | | | | | ✓ |

| 10PEXX | INFORMATION THEORY AND CODING | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

The students are expected to have the knowledge on

- Information theory and channel capacity
- Detection of signals and channels noise
- Source coding
- Error control codes
- Stochastic process

**Unit–I : Information Theory**

Information – Measure of Information - Information Rate – Power Spectral Density - Entropy - Entropy of Symbols – Joint and Conditional Entropies - Basic Relationship Among Different Entropies - Mutual Information, Redundancy and

Efficiency - Continuous and Discrete Communication Channels - Discrete Memory Less Channels - Channel Representations – BSC, BEC – Channel Capacity.

**Unit–II : Detection of Signals and Channels with Noise**

Hypothesis Testing - Baye's Criterion - Minimum Error Probability Criterion, Neyman Pearson Criterion, Minmax Criterion - Maximum Likelihood Detector - Wiener Filter - Continuous and Discrete Channels with Noise - Shannon Hartley Theorem and Its Implications.

**Unit–III : Source Coding**

Purpose of Encoding and Decoding - Uniquely Decipherable Codes - Code Efficiency and Redundancy - Shannon's First and Second Fundamental Theorem - Shannon's Encoding Algorithm – Shannon Fanon Code - Huffman Code.

**Unit–IV : Error Control Codes**

Introduction - Types of Errors - Methods of Controlling Errors - Error Detection and Correction Linear Block Codes - Hamming Codes - Binary Cyclic Codes - Syndrome Calculation - BCH Codes - Burst Error Correcting Codes - Convolutional Codes.

**Unit–V : Stochastic Processes**

Classification - Stationary Processes - Ergodic Processes - Independent Increment Processes - Markov Processes - Counting Processes - Narrow Band Processes - Stochastic Processes for Analysis of Physical Phenomena, Brownian Motion - Normal (Gaussian) Minor - Leri Poisson, Bernoulli and Short Noise Processes - Auto Correction Function.

**TEXT BOOKS**

1) K. Sam Shanmugam, “Digital and Analog communication systems”, John Wiley, 2006.
2) Das, S.K. Mullick, P.K. Chatterjee, "Principles of Digital Communication", Wiley Easter Limited, 1986.

**REFERENCE BOOKS**

1) Viterbi A.J., Omura J.K., "Principles of Digital Communication and Coding", McGraw Hill.
2) Eugene Xavier S.P, "Statistical Theory of Communication”, New Age International, 1997.
3) Simon Haykin, “Digital communication”, John Wiley, 2003.

**COURSE OUTCOMES**

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

1) Measure the Information and use it for effective coding.
2) Summarize how the channel capacity is computed for various channels.
3) Use various techniques involved in basic detection and estimation theory to solve the problem.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | ✓ | | | | | ✓ | |
| CO2 | ✓ | ✓ | | | | | | | ✓ | |
| CO3 | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |

| 10PEXX | DSP PROCESSOR ARCHITECTURE AND PROGRAMMING | L | T | P |
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**COURSE OBJECTIVES**

- To give an exposure to the various fixed point and floating point DSP architectures
- To understand the techniques to interface sensors and I/O circuits
- To implement applications using these processors.

**Unit–I : Fundamentals of Programmable DSP's**

Review of Fixed-Point and Floating Point Numbers - Fixed-Point and Floating Point Arithmetic-Multiplier and Multiplier accumulator – Modified Bus Structures and Memory Access in PDSP's – Multiple Access Memory – Multi Port Memory – VLIW Architecture – Pieplining – Special Addressing Modes in PDSP's – On Chip Peripherals.

**Unit–II : TMS320C54X Processor**

Introduction - Architecture of 54X, 54X Buses, Internal Memory Organisation, Central Processing Unit— Data Addressing, Instruction Set, Pipeline Operation, Code Compressor Studio - Application Programs.

**Unit–III : DSP56XXX Processor**

Freescale DSP56XXX Architecture and Programming - Introduction, Core Architecture Overview, Data Arithmetic Logic Unit, Address Generation Unit, Program Control Unit, PLL and Clock Generator, Debugging Support, Instruction Cache, External Memory Interface, DMA Controller, Operating Modes and Memory Spaces, Instruction Set, Benchmark Programs.

**Unit–IV : Filtering Using DSP56XXX**

FFT and Filter Implementation using DSP56XXX - Implementation of FFT : Radix- 2 Fast Fourier Transforms – Block Floating Point Scaling – Optimized Radix-2 DIT FFT- Leakage- Implementation of Digital Filters: Single and Double Precision FIR Filters – IIR Filters – Multirate Filters.

**Unit–V : TMS320C6X Processor**

TMS320C6x Architecture:CPU Operation – Pipelined CPU- VelociTI – C64x DSP-Software tools: EVM – DSK Target C6x board – Assembly File – Memory Management- Compiler Utility- Code Initialization – Code Composer Studio – Interrupt Data Processing.

**TEXT BOOKS**

1) Randy Yates, "Technical Reference Fixed-Point Arithmetic: An Introduction", Digital Signal Labs, 2013.
2) Jean-Michel Muller,NicolasBrisebarre,Florent de Dinechin, Claude-Pierre Jeannerod Vincent Lef`ever, Guillaume Melquiond, Nathalie Revol, Damien Stehl´e, Serge Torres "Handbook of Floating-Point Arithmetic", Birkhauser Boston, 2010.

**REFERENCE BOOKS**

1) B. Venkataramani, M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Application", Tata McGraw Hill, New Delhi, 2011.
2) Nasser Kehtarnavaz and Mansour Keramat, "DSP System design using the TMS320C600 Prentice Hall, 2000.

3) Digital Signal Processing Applications using the ADSP – 2100 Family, Volume 1 Analog devices, DSP Division Prentice Hall, 1992.
4) Mohammed El-Sharkawy, Digital Signal Processing Applications With Motorola's DSP56002 Processor, Prentice Hall, 1997|
5) Sophocles J. Orfanidis, "Introduction to signal processing", Prentice Hall, 1996.
6) SenM. Kuo, Bob H. Lee," Real – time digital signal processing- Implementations, applications and experiments with the TMS320C55x", John Wiley and Sons, 2001.
7) John G. Proakis and Dimitris G. Manolakis, "Digital signal processing – Principles, Algorithms and applications", Fourth Edition Prentice Hall, 2007.
8) DSP56300 Family Manual from Freescale Semiconductors. 2008.

**COURSE OUTCOMES**

At the end of the course student will be able to

1) Learn the architecture details of fixed point DSPs
2) Learn the architecture details of floating point DSPs
3) Infer about the control instructions, interrupts, pipeline operations, memory and buses.
4) Illustrate the features of on-chip peripheral devices and its interfacing with real time application devices
5) Learn to implement the signal processing algorithms and applications in DSPs

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | | | | | | | | | |
| CO3 | ✓ | ✓ | | ✓ | | | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | | | | | |
| CO5 | ✓ | | ✓ | ✓ | | | | | | |

| 10PEXX | MOBILE ADHOC NETWORKS | L | T | P |
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**COURSE OBJECTIVES**

- Students will get an introduction to Ad Hoc wireless network
- To study the introduction of protocols
- To study the architecture of MANET
- Enable the students to know techniques involved to support mobility

**Unit–I : Introduction**

Introduction to Ad Hoc Networks – Definition, Characteristics Features, Applications of Ad Hoc Networks-Challenges and Advantages- Characteristics of

Wireless Channel-Ad Hoc Mobility Models- Entity and Group-IEEE Standards: 802.11a, 802.11b, 802.11g, 802.15.

**Unit–II : Routing Basics**

Function of Network Layer-MAC Protocols-Design Issues, Goals and Classification- Routing Algorithms-Contention Based Protocols, Reservation Based Protocols- Distance Vector and Link State Routing Concepts- Hierarchical Routing.

**Unit–III : Ad Hoc Network Protocols**

Designing A Routing Protocol for Ad Hoc Wireless Networks-Goals and Classification of Routing Protocols-Proactive Vs Reactive Routing-Ad Hoc on Demand Distance Vector Routing (AODV)-Destination Sequenced Distance Vector Routing (DSDV)-Hybrid Routing Algorithm-TORA-Multicast Routing Algorithms - Power-Energy Aware Routing Algorithm- QOS Aware Routing.

**Unit–IV : End -To - End Delivery and Security**

Transport Layer: Issues in Designing- Transport Layer Classification, Ad Hoc Transport Protocols. Security Issues in Ad Hoc Networks: Issues and Challenges, Network Security Attacks, Secure Routing Protocols-MANET Simulation Tools.

**Unit–V : Cross Layer Design and Quality of Service**

Need for Cross Layer Design, Cross Layer Optimization, Parameter Optimization Techniques-QOS Routing Protocol-Predictive and Location Based QOS Routing Protocol- on Demand QOSRouting Protocol- Integration of Ad Hoc With Mobile IP Networks Research Issues of Adhoc Networking.

**TEXT BOOKS**

1) C. Siva Ram Murthy and B.S. Manoj, Ad hoc Wireless Networks Architectures and Protocols, Second Edition, Pearson Education. 2007.
2) Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

**REFERENCE BOOKS**

1) Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobilead hoc Networking, Wiley-IEEE press, 2004.
2) Mohammad Ilyas, The Hand Book of adhoc wireless networks, CRC press, 2002.
3) T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network Research," Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
4) A Survey of Integrating IP Mobility Protocols and Mobile Ad hoc Networks, Fekri M. Abduljalil and Shrikant K. Bodhe, IEEE Communication Survey and Tutorials, Vol. 9. No.1.
5) V.T. Raisinhani and S. Iyer "Cross Layer Design Optimization in Wireless Protocol Stacks", Comp. Communication, Vol. 27 No.8, 2004.
6) V.T. Raisinhani and S. Iyer, "ÉCLAIR; An Efficient Cross-Layer Architecture for Wireless Protocol Stacks", World Wireless Cong., San Francisco, CA, May, 2004.
7) V. Kawadia and P.P. Kumar, "A Cautionary Perspective on Cross-Layer Design, "IEEE Wireless Commn., Vol. 12, No.1, 2005.

**COURSE OUTCOMES**

1) To conduct network model
2) To analyze the performance of routing protocol
3) To know the methods of cross layer design
4) To understand the concept of network simulation

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | ✓ | | ✓ | | | | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | ✓ |
| CO3 | ✓ | ✓ | ✓ | | | ✓ | | | | |
| CO4 | ✓ | | | ✓ | | ✓ | | | | |

| 10PEXX | MODERN COMMUNICATION SYSTEMS | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

- Students will get an introduction about ISDN and its protocol,
- Data link layer, ATM network concepts and its architecture, internet concepts and mobile communication systems

**Unit–I : ISDN Overview**

A Conceptual view of ISDN - ISDN Standards - Service Capabilities – Tele Service Protocol Architecture- Facsimile – Teletex Message Handling System. ISDN Interfaces and Function; Transmission Structure - User Network Interface Configuration - ISDN Protocol Architecture - ISDN Connection - Terminal Adaptation - Addressing - Internet Working. ISDN Physical Layer: Line Coding Techniques, Basic User Network Interface - Primary User Role Network Interface.

**Unit–II : ISDN Data Link Layer**

LAPD, Bearer Channel Link Control Using 465/ V 120 Frame Mode Bearer Service And Protocol. ISDN Network Layer: ISDN Call Control, Frame Relay Connection Control. Signaling System Number Z: SS7 Architecture, Signaling - Data Link Level - Link Level Network Level - Signaling Connection Control Part - ISDN User Part, ATM Networking Capabilities - ATM Networking Asynchronous Technology Problems Address By ATM, ATM Solution, ATM Cell And Its Structure.

**Unit–III : ATM Network Concepts and Architecture**

ATM's Position in the OSI Model-BISDN Protocol Reference Model - ATM Functions and Layers, ATM Signaling Principals, ATM Performances: Merging Voice, Audio, Data And Video, ATM Traffic Control, ATM Operation And Maintenance, ATM Reference Configuration. ATM Protocol Stack: Lower Layers Fiber Based Networks and its Advantages - ATM Physical Layer Media. ATM Transmission Convergence Sub Layer - ATM Switching Principles, OAM Function and Signaling.

**Unit–IV : Internet Concepts**

The Net and its Features Main Internet Features, Email News Groups, Telnet, Gopher, Browsing In WWW. Control Modems: Speed/ Time Continuum, Communication Software Internet Finding Tools, Archie, Gopher Commands:

TCP/IP Pictures, Graphics and Binary Files Via News Groups: Compression Software: Processing Files - Sound and Images: Animation, Internet Resources - Library Card Catalogues: Establishing Web Services Intranet - Creating Web Home Page.

**Unit–V : Mobile Communication Systems**

GSM - IS95 - Network Aspects - Radio Aspects - Security Aspects - Low Speed Circuit Switched Data in Digital Cellular Networks - High Speed Circuit Switched Data in GSM - Packet Switched Data in Digital Cellular Networks - Data Services over DECT, CT2 and PACS - GPRS - CDMA 1x, CDMA 3X, CDMA 2000 and WCDMA.

**TEXT BOOKS**

1) Raj Pandya, "Mobile and Personal Communication System and Services", John Wiley & Sons, 2004.
2) Winch, R.G., "Telecommunication Transmission Systems", McGraw Hill, Second Edition 1998.

**REFERENCE BOOKS**

1) Stallings, W., "ISDN and B.ISDN", Pearson Education Asia, 2000.
2) Glosshrenner A., "Internet 101 Computing" McGraw Hill, Second Edition, 1995.
3) Rhee M.Y., "Cryptography and Secure Communications", McGraw Hill, 1994.

**COURSE OUTCOMES**

At the end of this course the students will have a wide knowledge on

1) ISDN and its protocol,
2) Data link layer, ATM network concepts and its architecture
3) Internet concepts and mobile communication systems

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | | | ✓ | | | | |
| CO2 | ✓ | ✓ | | | | ✓ | | | | |
| CO3 | ✓ | | | | | ✓ | | | | |

| 10PEXX | TELECOMMUNICATION SWITCHING AND NETWORKS | L | T | P |
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**COURSE OBJECTIVES**

- To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.

- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterize blocking probability holding service time distributions for in speech and data networks.

**Unit–I : Multiplexing**

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings, SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

**Unit–II : Digital Switching**

Switching Functions, Space Division Switching, Time Division Switching, two dimensional switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SS7 signaling.

**Unit–III : Network Synchronization Control and Management**

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

**Unit–IV : Digital Subscriber Access**

ISDN: ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

**Unit–V : Traffic Analysis**

Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

**TEXT BOOKS**

1) J. Bellamy, “Digital Telephony”, John Wiley, Third Edition 2007.
2) JE Flood, “Telecommunications Switching, Traffic and Networks”, IET, 1997.

**REFERENCE BOOKS**

1) R.A. Thomson, “Telephone switching Systems”, Artech House Publishers, 2000.
2) W. Stalling, “Data and Computer Communications”, Prentice Hall, Tenth Edition, 2014.
3) T.N. Saadawi, M.H. Ammar, A.E. Hakeem, “Fundamentals of Telecommunication Networks”, Wiley Interscience, 1994.

4) W.D. Reeve, "Subscriber Loop Signaling and Transmission Hand Book", IEEE Press (Telecomm Handbook Series), 1995.
5) Viswanathan. T., "Telecommunication Switching System and Networks", Prentice Hall of India Ltd., 2015.

**COURSE OUTCOMES**

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

1) To understand the concepts of Frequency and Time division multiplexing.
2) To analyze digital multiplexing and digital hierarchy namely SONET / SDH
3) To discuss the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
4) To explain the statistical modeling of telephone traffic, blocking system characteristics and queuing system characteristics.
5) To examine blocking probability holding service time distributions for in speech and data networks.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | ✓ | ✓ | | ✓ | | ✓ | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |
| CO5 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |

| 10PEXX | WAVELETS AND ITS APPLICATIONS | L | T | P |
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**COURSE OBJECTIVES**

- To expose the students to the basics of wavelet theory and to illustrate the use of wavelet processing.

**Unit–I : Fourier Analysis**

Fourier basis & Fourier Transform – failure of Fourier Transform – Need for Time-Frequency Analysis – Heisenberg's Uncertainty principle – Short time Fourier transform (STFT) - short comings of STFT- Need for Wavelets.

**Unit–II : CWT and MRA**

Wavelet basis – Continuous time Wavelet Transform (CWT) – need for scaling function – Multi-Resolution Analysis (MRA) – important wavelets: Haar, Mexican hat, Meyer, Shannon, Daubechies.

**Unit–III : Introduction to Multirate Systems**

Decimation and Interpolation in Time domain - Decimation and Interpolation in Frequency domain – Multi rate systems for a rational factor.

**Unit–IV : Filter Banks and DWT**

Two channel filter bank – Perfect Reconstruction (PR) condition – relationship between filter banks and wavelet basis – DWT – Filter banks for Daubechies wavelet function.

**Unit–V : Special Topics (Only Introductory Level)**

Multi wavelets, Multidimensional wavelets – wavelet packet transform. Applications: Feature extraction using wavelet coefficients, Image compression, Wavelet based denoising.

**TEXT BOOKS**

1) Jaideva C. Goswami and Andrew K. Chan, "Fundamentals of Wavelets – Theory, Algorithms and Applications", John Wiley & Sons, Second Edition, 2011.
2) Soman, K.P. and Ramachandran, K.I., "Insight into Wavelets from Theory to Practice", Prentice Hall, New Delhi, 2010.

**REFERENCE BOOKS**

1) Sidney Burrus, C., "Introduction to Wavelets and Wavelets Transforms", Prentice Hall, New Delhi, 2002.
2) Stephane G. Mallat, "A Wavelet Tour of Signal Processing", Academic Press, 2009.
3) Raghuveer M. Rao and Ajit S. Bopardikar, "Wavelet Transforms: Introduction to Theory & Applications", Pearson Education Asia, New Delhi, 2003.

**COURSE OUTCOMES**

Students are able to

1) Understand about fourier transform and difference between fourier transform and wavelet transform.
2) Understand wavelet basis and characterize continuous and discrete wavelet transforms
3) Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties
4) Implement discrete wavelet transforms with multirate digital filters
5) Design certain classes of wavelets to specification and justify the basis of the Application of wavelet transforms to different fields.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | | | ✓ | | | | | | |
| CO3 | ✓ | ✓ | ✓ | | | | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | | | | | |
| CO5 | ✓ | ✓ | ✓ | | | | | | | |

| 10PEXX | DATA COMMUNICATION | L | T | P |
|---|---|---|---|---|
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**COURSE OBJECTIVES**

- To understand the concept of data communication and data coding techniques.
- To comprehend the use of different types of digital data interfaces and modems.
- To understand the concept of network architecture and protocols
- To understand the division of network functionalities into layers.
- To be familiar with the components required to build different types of networks.
- To be exposed to the required functionality at each layer
- To learn the flow control and congestion control algorithms

**Unit–I : Basic Concepts**

Introduction – Data communication system – Data communication links: Point-to - Point- Multipoint-Topology-Digital data transmission – Digital data rates – Serial and Parallel data formats – Encoded data formats – OSI model – Protocols and Standards – Transmission modes – Categories of network.

**Unit–II : Digital Data Interfaces and Modems**

Interconnection devices - Inter connection issues - DTE – DCE interface – Other interface standards – Network Interface Cards - MODEMS – Cable modem – Unguided media – Transmission impairments performance-Interconnection of LANS-IEEE 802.6 man– X.25 packet switched protocols – ATM, Frame relay – IEEE 802.11 wireless LANS using CSMA/CD.

**Unit–III : Data Link Layer**

Logical link control Functions: - Framing, Flow control, Error control: CRC, LLC protocols: - HDLC. Medium access layer:- Random access, Controlled access, Channelization, Data link layer: Design issues – Service primitives – Stop and Wait - Sliding window protocols –Go-back N- Selective repeat protocols.

**Unit–IV : Network and Transport Layers**

Network layer: Design issues - Routing algorithm - Congestion control algorithms internetworking. Quality of Service. Transport layer: Design issues- The Transport Service - Elements of transport protocol- Connection management - Performance Issues.

**Unit–V : Session, Presentation and Application Layers**

Session Layer: Design issues -Remote procedure call – Abstract syntax notation - Presentation Layer: Design issues - Data compression techniques-cryptography - Application Layer: DNS-(Domain Name System) - File Transfer, Access and Management -Electronic mail - Virtual Terminal -World Wide Web.

**TEXT BOOKS**

1) Behrouz A. Forouzan, “Data Communication and Networking”, Tata McGraw Hill, New Delhi, Second Edition, 2006.
2) Andrew S. Tanenbaum. "Computer Networks", 5th Edition, Prentice Hall of India, 2011.

**REFERENCE BOOKS**

1) William A. Shay, “Understanding Data Communication Networks”, Books/Cole Thomson Learning, Singapore, First Edition, 2001.
2) William Stalling, “Data and Computer Communication”, PHI, New Delhi, Fifth Edition, 2001.
3) Schwartz M., "Computer Communication", McGraw Hill, 2002.
4) Gerd E. Keiser," Local Area Networks", McGraw Hill Publication, 2nd edition, 2002.
5) Bertsekas D. and Gallagher R., "Data networks, 2nd Edition, Prentice Hall of India, 2004.

**COURSE OUTCOMES**

1) Have a good understanding of the data communication system and modes of transmission.
2) Have a basic knowledge of the use of digital data interfaces.
3) Have a working knowledge of network architecture and protocols.
4) Identify the components required to build different types of networks.

5) Choose the required functionality at each layer for given application.
6) Identify solution for each functionality at each layer.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | ✓ | ✓ | ✓ | | | | | | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | | | | | | |
| CO5 | ✓ | | | | | | | | | |
| CO6 | ✓ | ✓ | | | | ✓ | | | | |

| 10PEXX | MULTIMEDIA COMPRESSION TECHNIQUES | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

**Unit–I : Introduction**

Overview of information theory, redundancy - Taxonomy of compression techniques -Overview of source coding, source models, Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, scalar quantization, vector quantization, rate distortion theory, structure quanitizers - Evaluation techniques-error analysis and methodologies.

**Unit–II : Text Compression**

Huffmann coding - Arithmetic coding – Shannon - Fano coding and dictionary techniques - LZW family algorithms - Entropy measures of performance - Quality measures.

**Unit–III : Audio Compression**

Audio compression techniques-frequency domain and filtering-basic subband coding-application to speech coding-G.722-application to audio coding-MPEG audio, progressive encoding for audio - Silence compression, Speech compression techniques - Vocoders.

**Unit–IV : Image Compresion**

Predictive techniques - PCM, DPCM, DM, Transform coding, Introduction to JPEG, JPEG-2000, JBIG standards, Study EZW, SPIHT algorithm.

**Unit–V : Video Compression**

Video signal representation - Video compression techniques-MPEG, Motion estimation techniques- Overview of Wavelet based compression and DVI technology, Motion video compression - PLV performance - DVI real timecompression.

**TEXT BOOKS**

1) Sayood Khaleed, "Introduction to Data Compression", Morgan Kauffman, London, 2006.
2) Gibson, J.D., Berger, T., Lookabaugh, T., D. Lindbergh, and R.L. Baker, "Digital Compression for Multimedia: Principles and Standards", Morgan Kaufmann, 1998,

**REFERENCE BOOKS**

1) Watkinson J, "Compression in Video and Audio", Focal Press, London,1995.
2) Mark Nelson, "Data Compression Book", BPB Publishers, New Delhi, 1998.
3) Jan Vozer, "Video Compression for Multimedia", AP Profes, New York, 1995.

**COURSE OUTCOMES**

Upon Completion of the course, the students will be able to

1) Describe various multimedia components.
2) Describe compression and decompression techniques.
3) Apply the compression concepts in multimedia communication.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | ✓ | | | | |
| CO2 | ✓ | ✓ | | | | ✓ | | | | |
| CO3 | ✓ | ✓ | ✓ | | | ✓ | | | | |

| 10PEXX | EMBEDDED SYSTEMS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To expose the students to the fundamentals of microprocessor architecture
- To introduce the advanced features in microprocessors and microcontrollers
- To enable the students to understand various microcontroller architectures

**Unit–I : High Performance CISC Architecture – Pentium**

CPU Architecture- Bus Operations – Pipelining – Brach predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming the Pentium processor.

**Unit–II : High Performance RISC Architecture – ARM**

Arcon RISC Machine – Architectural Inheritance – Core & Architectures – Registers – Pipeline – Interrupts – ARM organization – ARM processor family – Co-processors – ARM instruction set- Thumb Instruction set – Instruction cycle timings – The ARM Programmer's model – ARM Development tools – ARM Assembly Language Programming – C programming – Optimizing ARM Assembly Code – Optimized Primitives.

**Unit–III : ARM Application Development**

Introduction to DSP on ARM –FIR filter – IIR filter – Discrete fourier transform – Exception handling – Interrupts – Interrupt handling schemes- Firmware and bootloader – Embedded Operating systems – Integrated Development Environment-

STDIO Libraries – Peripheral Interface – Application of ARM Processor – Caches – Memory protection Units – Memory Management units – Future ARM Technologies.

**Unit–IV : Motorola 68HC11 Microcontrollers**

Instruction set addressing modes – operating modes- Interrupt system- RTC-Serial Communication Interface – A/D Converter PWM and UART.

**Unit–V : PIC Microcontroller**

CPU Architecture – Instruction set – interrupts- Timers- I2C Interfacing –UART-A/D Converter –PWM and introduction to C-Compilers.

**TEXT BOOKS**

1) Andrew N. Sloss, Dominic Symes and Chris Wright, "ARM System Developer"s Guide: Designing and Optimizing System Software", First edition, Morgan Kaufmann Publishers, 2004.
2) Barry B. Brey, "The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing", Prentice Hall of India Private Limited, New Delhi, 2003.

**REFERENCE BOOKS**

1) Rajkamal, "The Concepts and Feature of Micro Controllers 68HC11, 8051 and 8096", S Chand Publishers, New Delhi.
2) Steve Furber, "ARM System – On-Chip Architecture", Addision Wesley, 2000.
3) Daniel Tabak, "Advanced Microprocessors", McGraw Hill. Inc., 1995
4) James L. Antonakos, "The Pentium Microprocessor", Pearson Education, 1997.
5) Gene H. Miller, "Micro Computer Engineering", Pearson Education, 2003.
6) John B. Peatman, "Design with PIC Microcontroller", Prentice Hall, 1998.
7) John Peatman, "Design with Microcontroller", McGraw Hill Publishing Co Ltd, New Delhi, 2007.
8) Alan Clements, "The Principles of Computer Hardware", Oxford University Press, Third Edition, 2006.

**COURSE OUTCOMES**

The student will be able to work with suitable microprocessor / microcontroller for a specific real world application.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ | |

| 10PEXX | BIOMEDICAL SIGNAL PROCESSING | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To understand the fundamentals of signal processing for various bio-signal analysis
- To apply common signal processing techniques for various biomedical signals.

- To impart knowledge about filter characteristics and to design various filters
- To provide an in-depth knowledge about the basic concepts of wavelet analysis
- To apply various signal processing techniques in analyzing the various bio- signal
- To study about the characteristics of non stationary signals

**Unit–I : Analysis of Biosignals**

Automatic analysis and classification of ECG, P-wave detection, QRS complex detection, Correlation analysis of ECG signals, Signal averaged ECG, Analysis of Heart Rate variability, Synchronized averaging of PCG envelopes, envelogram, Analysis of PCG signal, Analysis of EMG signal- EEG signal characteristics – EEG analysis.

**Unit–II : Spectral Analysis**

Spectral analysis: Estimation of power density spectrum, Periodogram - Parametric model based spectral Linear prediction theory, estimation Auto regressive (AR), Moving average (MA) Autoregressive moving average (ARMA) models. Estimation of parameters - spectral error measure of EEG analysis.

**Unit–III : Adaptive Signal Processing**

Optimal and adaptive filters: Weiner filters, Adaptive signal processing - Steepest descent algorithm LMS adaptive algorithm, Adaptive noise canceller – cancellation of 50 Hz signal in ECG - cancellation of maternal ECG in fetal electrocardiography. ECG data reduction Techniques: Direct ECG data compression - transformation compression – comparison.

**Unit–IV : Wavelets for BSP**

Introduction to wavelets, Time frequency representation, Discrete wavelet transform, pyramid algorithm, Comparison of Fourier transform and wavelet transform, Applications - wavelet de-noising- discontinuity detection- feature detection-wavelet packets -wavelet compression.

**Unit–V : Advanced Topics in BSP**

Analysis of non stationary signals - time variant system – Fixed segmentation - Short time Fourier transform, autocorrelation function method, Spectral error measure method, generalized likelihood ratio, Adaptive segmentation.

**TEXT BOOKS**

1) Reddy, D.C., “Biomedical Signal Processing: Priniciples and Techniques”, Tata McGraw Hill, New Delhi, 2nd edition, 2005.

2) Rangaraj M. Rangayyan, “Biomedical Signal Processing”, IEEE Press, First Edition, 2002.

**REFERENCE BOOKS**

1) John G, Proakis and Dimitris Manolakis G. “Digital Signal Processing, Algorithms and Applications”, PHI of India Ltd., New Delhi, fourth Edition, 2007.

2) Sanjit K. Mitra “Digital Signal Processing”, A Computer Based Approach”, Tata McGraw Hill, New Delhi, Fourth Edition, 2011.

3) Raghuveer M. Rao et al: Wavelet Transforms - Introduction to Theory and Applications, Pearson Education Asia, 2003.

4) John L. Semmlow, Biosignal and Biomedical Image Processing, Matlab Based Applications, Marcel Dekker Inc. New York, 2004.

**COURSE OUTCOMES**

Upon Completion of the course, the students will be able to

1) Understand the fundamentals of signal processing for various bio-signal analysis
2) Apply common signal processing techniques for various biomedical signals.
3) Impart knowledge about filter characteristics and to design various filters
4) Provide an in-depth knowledge about the basic concepts of wavelet analysis
5) Apply various signal processing techniques in analyzing the various bio- signal
6) Study about the characteristics of non stationary signals

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | ✓ | | ✓ | | | | | | |
| CO3 | ✓ | ✓ | | ✓ | | | | | | |
| CO4 | ✓ | ✓ | | ✓ | | | | | | |
| CO5 | ✓ | ✓ | ✓ | | | | | | | |
| CO6 | ✓ | | | | | | | | | |

| 10PEXX | ELECTRONIC MEASUREMENTS AND INSTRUMENTATIONS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To introduce students to monitor, analyze and control any physical system.
- To understand students how different types of meters work and their construction
- To provide a student a knowledge to design and create novel products and solutions for real life problems.
- To introduce students a knowledge to use modern tools necessary for electrical projects.

**Unit–I : Basic Measurement Concepts**

Measurement systems - Static and dynamic characteristics - units and standards of measurements - error - accuracy and precision, types, statistical analysis -moving coil, moving iron meters – multi-meters - Bridge measurements : Maxwell, Hay, Schering, Anderson and Wien bridge.

**Unit–II : Basic Electronic Measurements**

Electronic Multi-meters - Cathode ray oscilloscopes - block schematic - applications - special oscilloscopes: delayed time base oscilloscopes, analog and digital storage oscilloscope, sampling oscilloscope - Q meters - Vector meters - RF voltage and power measurements - True RMS meters.

**Unit–III : Signal Generators and Analyzers**

Function generators -pulse and square wave generators, RF signal generators - Sweep generators - Frequency synthesizer -wave analyzer - Harmonic distortion analyzer - spectrum analyzer : digital spectrum analyzer, Vector Network Analyzer - Digital L,C,R measurements, Digital RLC meters.

**Unit–IV : Digital Instruments**

Comparison of analog and digital techniques - digital voltmeter – multi-meters - frequency counters - measurement of frequency and time interval- extension of frequency range -Automation in digital instruments, Automatic polarity indication, automatic ranging, automatic zeroing, fully automatic digital instruments, Computer controlled test systems, Virtual instruments.

**Unit–V : Data Acquisition Systems and Fiber Optic Measurement**

Elements of a digital data acquisition system - interfacing of transducers - multiplexing -data loggers -computer controlled instrumentation -IEEE 488 bus - fiber optic measurements for power and system loss - optical time domains reflecto-meter.

**TEXT BOOKS**

1) Albert D. Helfrick and William D. Cooper ," Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.
2) Ernest O. Doebelin, Measurement Systems - Application and Design, TMH, 2007.

**REFERENCE BOOKS**

1) Joseph J. Carr, Elements of Electronics Instrumentation and Measurement, Pearson Education, 2003.
2) Alan. S. Morris, Principles of Measurements and Instrumentation, Second Edition, Prentice Hall of India, 2003.
3) David A. Bell, Electronic Instrumentation and measurements, Prentice Hall of India Pvt. Ltd, 2003.
4) B.C. Nakra and K.K. Choudhry, Instrumentation, Measurement and Analysis, Second Edition, TMH, 2004.
5) James W. Dally, William F. Riley, Kenneth G. McConnell, Instrumentation for Engineering Measurements, Second Edition, John Wiley, 2003.

**COURSE OUTCOMES**

1) Measure various electrical parameters with accuracy, precision, resolution.
2) Use AC and DC bridges for relevant parameter measurement.
3) Select appropriate passive or active transducers for measurement of physical phenomenon.
4) Use Signal Generator, frequency counter, CRO and digital IC tester for appropriate measurement.
5) Test and troubleshoot electronic circuits using various measuring instruments.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | | ✓ | ✓ | | ✓ | | | | |
| CO3 | ✓ | | | | | | | | | |
| CO4 | ✓ | | ✓ | ✓ | | | | | | |
| CO5 | ✓ | ✓ | | ✓ | | ✓ | | | | |

## PE - LAB – PROFESSIONAL ELECTIVE LAB

1) Data Structures and C++ Lab
2) VLSI Lab
3) Networks and Lines Lab
4) Analog Integrated circuits Lab

| 10EPXXX | DATA STRUCTURES AND C++ LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

### COURSE OBJECTIVES

- To understand various object oriented concepts through simple programs.
- To understand the implementation of different data structures using C++
- To study the application of different data structures for implementing solutions to practical problems.
- To understand searching and sorting algorithms.

### LIST OF EXPERIMENTS

1) Class and objects
2) Constructors
3) Adding two objects with overloaded constructors
4) Function Returning objects
5) Array of objects
6) operator overloading
7) Single Inheritance
8) Multilevel Inheritance
9) File Operations
10) .Implementation of stack.
11) Implementation of queue.
12) Evaluation of postfix expression using stack
13) Implementation of single linked list
14) Implementation of Quick sort
15) Implementation of Binary Search tree.

### COURSE OUTCOMES

Upon completion of the course, the students will be able to

1) Implement various object oriented concepts through simple programs.
2) Implement different data structures using C++

3) Apply the different data structures for implementing solutions to practical problems.
4) Demonstrate searching and sorting algorithms.

| Mapping with Programme Outcomes (POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | | | | ✓ | | | | | | |
| CO2 | | | ✓ | ✓ | | | | | | |
| CO3 | ✓ | | | | | | | | | |
| CO4 | ✓ | ✓ | | | | | | | | |

| 10EPXXX | VLSI LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To gain expertise in design, development and simulation of digital circuits with VHDL.
- To implement digital circuits on FPGA/CPLD devices.
- To analyse and implement basic circuits using Tanner tool.

**LIST OF EXPERIMENTS**

1) Study of Xilinx simulation and synthesis tool.
2) Design of Unit–adders and subtractors
3) Design and testing of parallel adder-subtractor.
4) Design and testing of BCD adder.
5) Design and testing of multiplexer and demultiplexer.
6) Design and testing of four bit magnitude comparator.
7) Design and testing of array multipliers.
8) Design and testing of flip-flops.
9) Design and testing of synchronous counters.
10) Design and testing of asynchronous counters.
11) Design and testing of scrambler and descrambler.

**Experiments using TANNER tool**

12) Functional verification of CMOS inverter.
13) Functional verification of CMOS universal logic gates.
14) Analysis of Differential amplifier.
15) Layout of CMOS inverter.

**Tools**

Xilinx software, Tanner tool

**COURSE OUTCOMES**

Upon completion of the course the student will be able to

1) Develop a architecture of digital circuit for various applications
2) Develop VHDL model for digital circuits.
3) Implement digital circuits on FPGA/CPLD devices.

4) Develop layout of CMOS logic gates.

| Mapping with Programme Outcomes (POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | | | | | | | |
| CO2 | | | ✓ | | ✓ | | | | | |
| CO3 | ✓ | | | | | | | | | ✓ |
| CO4 | | | ✓ | | ✓ | | | | | |

| 10EPXXX | NETWORKS AND LINES LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To Understand characteristics of Symmetrical Networks and Transmission lines.
- To design passive filters and study its characteristics.
- To design attenuators and equalizers for given specification.

**LIST OF EXPERIMENTS**

1) Measurement of characteristic impedance and propagation constant for a symmetrical Network.
2) Determination of primary and secondary constants of a transmission line.
3) Determination of input impedance of a transmission line.
4) Design of Constant-K Low Pass filter.
5) Design of Constant-K High Pass filter.
6) Design of Constant-K Band Pass filter.
7) Design of Constant-K Band Reject filter.
8) Design of M-derived Low pass filter.
9) Design of M-derived High pass filter.
10) Design of Composite Low pass filter.
11) Design of Attenuators.
12) Design of Equalizers.

**COURSE OUTCOMES**

Upon completion of the course the student will be able to

1) Understand the characteristics of Networks and transmission lines.
2) Design different types of passive filters for given specification.
3) Design attenuators and equalizers.

| Mapping with Programme Outcomes (POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | | | | | | | |
| CO3 | | | ✓ | | | | | | | |

| 10EPXXX | ANALOG INTEGRATED CIRCUITS LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To experimentally study various applications of op-amp.
- To design of oscillators and amplifiers using Op-amp.
- To design and verify multivibrators using IC 555.
- To understand the principle of operation of ADC and DAC circuits.

**LIST OF EXPERIMENTS**

1) Design of Inverting, Non-Inverting and Differential amplifiers using Op-amp.
2) Design of Adders, Subtractors, Averaging amplifier
3) Design of Integrator and Differentiator using Op-amp.
4) Design of Log and Anti-log amplifiers.
5) Design and testing of Comparator, Zero crossing Detectors and Peak Detector using op-amps.
6) Design of Schmitt trigger using Op-amp.
7) Design of Oscillators using op-amp.
8) Instrumentation amplifier using Op-amp.
9) Design of Astable and Mono stable Multivibrators using IC 555.
10) Voltage control oscillator using LM-565.
11) Design of Voltage regulators.
12) Study of ADC and DAC.

**COURSE OUTCOMES**

Upon completion of the course the student will be able to

1) Demonstrate the applications of Op-amps.
2) Design Amplifiers and Oscillators using Op-amp.
3) Design astable and mono stable multivibrators using IC 555 timer.
4) Understand principle of operation of DAC and ADC.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | ✓ | | | | | | | | |
| CO2 | | | ✓ | | | | | | | |
| CO3 | | | ✓ | | | | | | | |
| CO4 | ✓ | ✓ | | | | | | | | |

## OPEN ELECTIVES

**OE – OPEN ELECTIVES**

1) Soft Computing Techniques
2) Quantitative Management Techniques
3) Network and Information Security
4) Cloud Computing
5) Biology for Engineers
6) Disaster Management
7) Entrepreneurship

8) National Service Scheme
9) Human Rights.

| 10OEXXX | SOFT COMPUTING TECHNIQUES | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

Upon completion of this course, the student should be able to get an idea on

- Artificial Intelligence, Various types of production systems, characteristics of production systems.
- Neural Networks, architecture, functions and various algorithms involved.
- Fuzzy Logic, Various fuzzy systems and their functions.
- Genetic algorithms, its applications.

**Unit–I : Soft Computing and Artificial Intelligence**

Introduction To Soft Computing, Soft Computing Vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing.

Introduction to Artificial Intelligence, Various Types of Production Systems, Characteristics of Production Systems, Breadth First Search, Depth First Search Techniques, Other Search Techniques Like Hill Climbing, Best First Search, A* Algorithm, AO* Algorithms and Various Types of Control Strategies. Knowledge Representation Issues, Prepositional and Predicate Logic, Monotonic and Non Monotonic Reasoning, Forward Reasoning, Backward Reasoning, Weak & Strong Slot & Filler Structures, NLP.

**Unit–II : Neural Network**

Structure and Function of a Single Neuron: Biological Neuron, Artificial Neuron, Definition of ANN, Taxonomy of Neural Net, Difference B/W ANN and Human Brain, Characteristic and Applications of ANN, Single Layer Network.

**Unit–III : Perceptron and Counter Propagation Network**

Perceptron Training Algorithm, Linear Separability, Widrow and Hebb's Learning Rule/Delta Rule, ADALINE, MADALINE, AI V/S ANN.Counter Propagation Network- Architecture, Functioning and Characteristics of Counter Propagation Network.

**Unit–IV : Fuzzy Logic Controller**

Functional Diagram - Fuzzification - Membership Value Assignments Using Intuition - Membership Functions - Defuzzification: Max-Membership Principle - Centroid Method - Weighted Average Method - Inference Engine – Knowledge Base - Rule Base - Case Studies.

**Unit–V : Genetic Algorithm, Hybrid Soft Computing Techniques and Applications**

Optimization – Traditional Optimization Methods – Concept of Evolutionary Algorithm – Genetic Algorithm – Encoding and Decoding of Variables – GA Operators – Reproductions – Cross Over – Mutation – Fitness Function – Fitness Scaling.

Neuro-Fuzzy Hybrid Systems – Genetic Neuro Hybrid Systems – Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems – Simplified Fuzzy ARTMAP – Applications: A Fusion Approach of Multispectral Images With SAR, Optimization of

Traveling Salesman Problem Using Genetic Algorithm Approach, Soft Computing Based Hybrid Fuzzy Controllers.

**TEXT BOOKS**

1) S.N. Sivanandam and S.N. Deepa, Principles of Soft Computing, Wiley Publications, 2nd Edition, 2011.
2) S, Rajasekaran and G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, 2009.

**REFERENCE BOOKS**

1) George J Klir, Bo Yuan, Fuzzy sets & Fuzzy Logic, Theory & Applications, PHI Publication.
2) N.K.Bose, Ping Liang, Neural Network fundamental with Graph, Algorithms & Applications, TMH, First Edition, 1998.
3) Bart Kosko, Neural Network & Fuzzy System, PHI Publication, First Edition, 2009.
4) Rich E, Knight K, Artificial Intelligence, TMH, Third Edition, 2012.
5) Martin T Hagen, Neural Network Design, Nelson Candad, Second Edition, 2008.

**COURSE OUTCOMES**

At the end of the course the students can able to

1) Learn about soft computing techniques and their applications.
2) Analyze various neural network architecture.
3) Define the fuzzy systems.
4) Analyze the genetic algorithms and their applications.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | ✓ | | | | | | |
| CO2 | ✓ | ✓ | ✓ | | | | | | | |
| CO3 | ✓ | ✓ | | | | | | | | |
| CO4 | ✓ | ✓ | ✓ | | | ✓ | | | | |

| 00OEXXX | QUANTITATIVE MANAGEMENT TECHNIQUES | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- Understood the basic of the quantitative techniques.
- Learnt about the application of probability techniques in the decision making.
- Learnt the various inventory models and simulations in the resource planning and management.

**Unit–I : Introduction**

Development of Scientific Management - Application of Operations Research – Classification of Operation Research (OR) Models – Procedures to Obtain Optimum Solution – Scope of or Management Information Systems (MIS) - Classification of

MIS - Cost Volume And Profit (CVP)Analysis - Relationships - Various Approaches – Limitation Of CVP Analysis.

**Unit–II : Probability Analysis**

Decision Making: Analysis for Decision Making - Cautions About Use of Decision Making Under Uncertain Future Conditions - Review of Probability Techniques and Applications - Calculation of Conditional and Expected Profits - Expected Value With Perfect Information - Use of Marginal Analysis - Utility as a Decision Criterion. Probability Distributions - Normal Distribution and Cost, Volume, Profit Analysis - Unit–Monetary Values with Probability Distribution - Decision Tree Analysis.

**Unit–III : Inventory and Production Models**

Inventory Decisions - Selective Approach to Management Inventory - EOQ - Different Models - Application of EOQ to Production Process. Reordering - Determination of Optimum Level - Optimal Level of Safety Stock - Joint Ordering - Reordering With Planned Stockouts - Discounts.

**Unit–IV : Linear Programming**

Introduction - Simplex Method - Maximization And Minimization - Duality in Linear Programming - Sensitivity Analysis - Transportation Method - Unbalanced Problem - Degeneracy - Assignment Method - Applications.

**Unit–V : CPM - PERT Analysis**

Introduction - Definition Of PERT - Network Replanning And Adjustment - CPM - Time Estimate - Crashing - Indirect And Utility Project Costs - PERT Cost Analysis - Project Budgeting - Control of Project Cost - Network Scheduling - Maximal Flow Problem – Limitation of PERT and CPM.

**TEXT BOOKS**

1) Gupta P.K, Manmohan, “Problems in Quantitative Techniques”, Sultan Chand & Sons, 2nd Edition, 1990.
2) Levin and Kirkpatrik “Quantitative Approaches to Management”, McgrawHill Int.St.Ed., 2002.

**REFERENCE BOOKS**

1) Samir Kumar Chakravarthy, “Theory and problems on Quantitative Techniques, Management Information system and Data processing” Central Educational Enterprises, 1989 (First Edition).
2) Levin and Kirkpatrik “Quantitative Approaches to Management”, McGraw Hill Int. St. Ed., 2002. Brandon-Jones, Slack: Quantitative Analysis in Operations Management: Prentice Hall.

**COURSE OUTCOMES**

On the completion of the course, students should able to

1) Understand statistical inference in relation to international business decision-making.
2) Analyse output from both specialist and general office software.
3) Convey the results of quantitative analysis.

**Mapping with Programme Outcomes(POs)**

| Course Outcomes | Programme Outcomes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | | | | ✓ | ✓ | | |
| CO2 | | ✓ | | ✓ | | | | ✓ | | |
| CO3 | ✓ | | | | | | ✓ | | | |

| 10OEXXX | NETWORK AND INFORMATION SECURITY | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

**Unit–I : Introduction**

Goals and Applications of Networks- LAN, WAN, MAN- Wireless network- Protocol hierarchies-Design issues of layer. - OSI reference model.

Computer Security - Introduction, Security Services, Security Mechanisms, Types of Attacks, Policy-Types of Policies- Cryptography - Plain text and Cipher Text, Substitution techniques- Transposition techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.

**Unit–II : Symmetric Key Algorithms**

Algorithms types and modes, Overview of Symmetric key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), RC4, RC5, Blowfish, Advanced Encryption Standard (AES), Differential and linear cryptanalysis, hash functions.

**Unit–III : Public Key Cryptosystems**

Brief history of Asymmetric Key Cryptography, Overview of Asymmetric Key Cryptography, RSA algorithm, Knapsack Algorithm, Elliptic curve cryptography, ElGamal, key management, Diffie Hellman key exchange and generation, Digital Signatures and authentication protocols-DSS.

**Unit–IV : Security Practice and System Security**

Authentication Service ,Certificate-based, Biometric Authentication– Kerberos, X.509 Authentication services - E-mail, security –PGP, IP security - Web security-SSL and TLS, SET. System security-Intruder, Intrusion detection system – Virus and related threats –Countermeasures – Firewalls design principles – Trusted systems.

**Unit–V : Wireless Network Security**

Security in Wireless Environment, Mobile Network Environment, Limitations, Attacks and security issues in mobile environment, WLAN- Security of 802.11 Wireless LANs, Security Requirements and Threats, Security in 2G Systems- GSM Security, I-Mode. Security in 3G-3G Wireless Communication systems, 3GPP

Objectives, 3G Security Architecture, Authentication and Key Agreement in 3GPP, Confidentiality and Data Integrity.

**TEXT BOOKS**

1) William Stallings, "Cryptography and Network Security", 8th Edition, Pearson Education, 2009.
2) Behrouz Forouzan, "Cryptography and Network Security", Tata McGraw Hill, 2008.

**REFERENCE BOOKS**

1) AtulKahate, "Cryptography and Network Security", Tata McGraw Hill, 2006.
2) Doughas R. Stinson, "Cryptography-Theory and Practice," CRC Press, 1995.
3) Wolfgang Osterhage, "Wireless Security", CRC Press, 2011.
4) Mark Stamp, "Information Security Principles and Practice" Wiley, Second Edition, 2011.
5) Matt Bishop, "Computer Security: Art and Science", Second Edition, Pearson Education, 2012.

**COURSE OUTCOMES**

Upon Completion of the course, the students will be able to

1) Implement basic security algorithms required by any computing system
2) Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
3) Analyze the possible security attacks in complex real time systems and their effective countermeasures
4) Analyze security threats related to wireless network.

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | ✓ | | | | ✓ | | | |
| CO2 | ✓ | ✓ | | | | | ✓ | | | |
| CO3 | ✓ | ✓ | | | | | ✓ | | | |
| CO4 | ✓ | ✓ | ✓ | | | | ✓ | | | |

| 10OEXXX | CLOUD COMPUTING | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- Gives the idea of evolution of cloud computing
- Provides knowledge about its services available today
- Helps to the design and development of simple cloud service.
- Focused on some key challenges and issues around cloud computing.

**Unit–I : Introduction**

Cloud-Definition, Benefits, Usage Scenarios, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business Models Around Clouds – Major Players in Cloud Computing - Issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.

**Unit–II : Cloud Services**

Types of Cloud Services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service – Communication as Services. Service Providers - Google, Amazon, Microsoft Azure, IBM, Sales Force.

**Unit–III : Collaborating Using Cloud Services**

Email Communication over the Cloud - CRM Management - Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

**Unit–IV : Virtualization for Cloud**

Need For Virtualization – Pros And Cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine Monitor – Virtual Machine Properties - Interpretation And Binary Translation, HLL VM - Hypervisors – Xen, KVM , Vmware, Virtual Box, Hyper-V.

**Unit–V : Security, Standards and Applications**

Security in Clouds: Cloud Security Challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed Management Task Force – Standards for Application Developers – Standards for Messaging – Standards For Security, End User Access to Cloud Computing, Mobile Internet Devices and The Cloud.

**TEXT BOOKS**

1) John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
2) Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.

**REFERENCE BOOKS**

1) David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2) Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3) Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill 2010.
4) Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5) G.J. Popek, R.P. Goldberg, Formal requirements for Virtualizable Third Generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974.
6) James E. Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

**COURSE OUTCOMES**

Upon Completion of the course, the students will be able to

1) Understand clearly about the introduction of cloud computing
2) Acquired knowledge about its services
3) Design and development of simple cloud service.
4) Implement Practical applications using cloud

5) Gain knowledge on some key challenges and issues around cloud computing

| Mapping with Programme Outcomes(POs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcomes | Programme Outcomes | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | ✓ | | | | | | | | | |
| CO2 | ✓ | ✓ | | | | | | | | |
| CO3 | ✓ | ✓ | ✓ | | ✓ | | ✓ | | | |
| CO4 | ✓ | ✓ | | | ✓ | | ✓ | | | |
| CO5 | ✓ | | | | | | | | | |

| 00OEXXX | BIOLOGY FOR ENGINEERS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- The course acts as a bridge between engineering and biology to provide basic understanding of biological mechanisms of living systems from engineering perspective.
- It will illustrate the many possible means to utilize living things' relevance to engineering principles.
- With substantial knowledge and continuing interest will make a student into a specialist in the technical diversity.

**Unit–I : Requirements of Biological Systems**

Biological Units Need Water; Biological Units Need the Right Amount of Oxygen; Biological Units Need Food and Nutrients; Biological Units Become Ill in the Presence of Wastes; Biological Units Need Heat Sources and Sinks.

**Unit–II : Behavior of Biological Systems**

Biological Units Adapt to Their Environments; Biological Units Modify Their Environments; Adaptations Require Extra Energy and Resources; Biological Units, If Possible, Move to Friendlier Environments; Biological Units Evolve under Environmental Pressures.

**Unit–III : Response to Stress by Biological Systems**

Crowding of Biological Units Produces Stress; Biological Units are Affected by Chemical Stresses; Biological Units Respond to Mechanical Stresses; Optimization is Used to Save Energy and Nutrient Resources; Biological Units Alter Themselves to Protect against Harsh Environments.

**Unit–IV : Existence of Biological Systems**

Biological Units Cooperate with Other Biological Units; Biological Units Compete with Other Biological Units; Biological Units Reproduce; Biological Units Coordinate Activities through Communication; Biological Units Maintain Stability with Exquisite Control; Biological Units Go through Natural Cycles; Biological Units Need Emotional Satisfaction and Intellectual Stimulation; Biological Units Die.

**Unit–V : Scaling Factors and Biological Engineering Solutions**

Allometric Relationships from Evolutionary Pressure; Dimensional Analysis; Golden Ratio; Fractal Scaling within an Organism; Self-Similarity for Tissues and Organs; Self-Similarity in Populations; Systems Approach; Relationships between Engineering and Biology; The Completed Design.

**TEXT BOOKS**

Arthur T. Johnson, "Biology for Engineers", CRC Press, 2010.

**REFERENCE BOOKS**

1) Aydin Tözeren, Stephen W. Byers, New Biology for Engineers and Computer Scientists, Pearson/Prentice Hall, 2004.
2) S. Thyaga Rajan, N. Selvamurugan, M.P. Rajesh, R.A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M.K. Jaganathan, "Biology for Engineers," Tata McGraw Hill, New Delhi, 2012.

**COURSE OUTCOMES**

- The ability to understand the information known about familiar living systems.
- The ability to anticipate the properties of an unfamiliar group of living things from knowledge about a familiar group.
- The ability to demonstrate the relevance of engineering to biological systems.
- The knowledge about the biological responses and it is scaling with respect to scientific principles that cannot be related back.
- The knowledge of biological principles and generalizations that can lead to useful products and processes.
- The ability to avoid or mitigate unintended consequences of dealing with any and all living system.

| 00OEXXX | DISASTER MANAGEMENT | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

This course helps in providing the basic concepts of disasters and also gives a thorough knowledge and experience to reduce disaster risks.

**Unit–I**

Introduction – Disaster- Characteristics and types of Disasters- Causes and effects of Disaster -Risk- Vulnerability – Preparedness- Disaster mitigation and disaster management- Classification of mitigation measures-Vulnerability Analysis- Observation and Perception of Vulnerability- Socio-Economic Factors of Vulnerability- Vulnerability in India- Disaster related policy goals of UNDP UNDRO and Govt. of India- Appraising disaster needs- Needs for technical expertise- Role of various Agencies in Disaster Management and Development -Disaster risk reduction planning- Role of Developmental Planning for disaster Management

**Unit–II**

Earthquake - Cause of Earthquake- General characteristics- Measuring Earthquakes- Distribution pattern of Earthquakes in India- Earthquake prone areas- case studies of important Indian earthquakes - Forecasting techniques and risk analysis- Possible risk reduction measures- earthquake resistance buildings and re-engineering techniques in India.

**Unit–III**

Tsunamis- Causes of a Tsunami- General Characteristics- Tsunami warning system-Distribution pattern of Tsunami in India- Possible risk reduction measures- Integrated coastal zone management.

Landslides- Rock falls- Avalanches- Mud flows and glaciers- Landslides and rock falls- landslide hazard zonation- Instrumentation and monitoring- Techniques for reducing landslide hazards.

**Unit–IV**

Tropical cyclones- Structure of tropical cyclones- Nature of tropical cyclones- Cyclone experience in India and Tamilnadu- Preparedness- Tropical cyclones and their warning systems- Tropical cyclone warning strategy in India special nature of the problem in the region- Classification- Protection of buildings from cyclones of India- Precautions during and before cyclones.

**Unit–V**

Coastal floods- Intensification of hazards due to human interference- Management-River and coastal floods- Temperature extremes and wild fires- Physiological hazards- Flood forecasting-mitigation- planning- management- flood prone areas the Indian scenario- Flood experience in India and Tamilnadu.

Environmental hazards- Typology- Assessment and response- Strategies -The scale of disaster-Vulnerability- Disaster trends- Paradigms towards a balanced view- Chemical hazards and toxicology-Biological hazards- Risk analysis- Other technological disasters.

**TEXT BOOKS**

1) David R. Godschalk (Editor), Timothy Beatiey, Philip Berke, David J. Browt, R, Edward J. Kaiser Charles C. Boh, R. Matthew Goebel, Natural Hazard Mitigation: Recasting Disaster Policy and Planning Island Press; (January 1999), ISBN) 559636025.
2) Sinha, P.C. Wind & Water Driven Disasters, 1998, 250pp, Anmol Publications.

**REFERENCE BOOKS**

1) Davide Wikersheimer Windstorm Mitigation Manual for Light Frame Construction, DIANE Publishing Co: (Paperback-May 1997).
2) Brown D. Redevelopment after the Storm: Hazard Mitigation Opportunities in the Post Disater Setting. (Paperback – June 1985) Publisher: John Wiley & Sons ISBN:047191505X.
3) Sinha, P.C., Technological Disasters, 1997, 516 pp Anmol Publications Trivedi.

**COURSE OUTCOMES**

1) Develop an understanding of the key concepts, definitions key perspectives of all Hazards Emergency Management.
2) Develop a basic under understanding of Prevention, Mitigation, Preparedness, Response and Recovery.

| 00OEXXX | ENTREPRENEURSHIP | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- Develop an entrepreneurship sprit.
- Help to identify business opportunities within an organization or independently.
- Initiate action on the business plan from the prospective business through EDC

**Unit–I**

Meaning – Characteristics of management – Nature of management – Process of management – Functional areas of management – Management and administration – Role of management – Level of management – Evolution of management.

**Unit–II**

Meaning - Nature of planning – Importance of planning – Types of planning – Steps in planning – Decision making – Meaning and definition of organizing – Steps in organizing – Nature of organization – Organization structure – Purpose of organization – Principles of organization – Delegation of authority – Nature and importance of staffing.

**Unit–III**

Meaning and nature of direction – Principles of directing – Leadership and leadership style – Motivation – Communication – Need and feedback in communication – Importance of communication – Channels of communication – Types of communication – Forms of communication.

**Unit–IV**

Evolution of concept of entrepreneur – Concept of entrepreneur – Characteristics of entrepreneur – Distinction between entrepreneur and manager – Technical entrepreneur – Charms of being an entrepreneur – Types of entrepreneur – Role of entrepreneurship in economic development – Barriers in entrepreneurship.

**Unit–V**

Meaning of project – Project classification – Project identification – Meaning and significance of project report – Contents of a project report – Formulation of project report – Planning commission guidelines – Identification of opportunity – Project feasibility study.

**TEXT BOOKS**

1) Veerabhadrappahavinal, Management and entrepreneurship, New age International, New Delhi, 2008.
2) Peter F. Drucker; Innovation and entrepreneurship, Butterworth – Heinemann, London, 1985.

**REFERENCE BOOKS**

1) "Creativity, Innovation, Entrepreneurship and Enterprise in Construction and Development", University of Reading, Alan Barrell – Entrepreneur in Residence Entrepreneur in Residence, University of Xiamen, Xiamen 2012.
2) "Entrepreneurship Studies", National University Commission (Nigerian University System), 2010.

**COURSE OUTCOMES**

At the end of this course the student should have an understanding about entrepreneurship. The students should have knowledge about the principles of business Plan.

| 00OEXXX | NATIONAL SERVICE SCHEME | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

- Understand the community in which they work and their relation.
- Identify the needs and problems of the community and involve them in problem-solving.

- Develop capacity to meet emergencies and natural disasters.
- Practice national integration and social harmony and
- Utilize their knowledge in finding practical solutions to individual and community problems.

**Unit–I : National Service Scheme**

A) History and its Objectives

B) Organizational structure of N.S.S. at National, State, University and College Levels

C) Advisory committee and their functions with special reference to college principal, Programme officer, N.S.S. group leader and N.S.S. volunteers in the implementation.

**Unit–II : National Integration**

A) Need of National integration

B) Various obstacles in the way of National Integration; such as caste, religion, language and provisional problems etc.

**Unit–III : Special Programme**

A) Legal awareness

B) Health awareness

C) First-aid

D) Career guidance

E) Leadership training - cum - Cultural Programme

F) Globalization and its Economic Social Political and Cultural impacts.

**Unit–IV : Special Camping Programme**

A) Nature and its objectives

B) Selection of camp site and physical arrangement

C) Organization of N.S.S. camp through various committees and discipline in the camp

D) Activities to be undertaken during the N.S.S. camp

E) Use of the mass media in the N.S.S. activities.

**Unit–V : N.S.S. Regular Activities**

A) Traffic regulation

B) Working with Police Commissioner's Office

C) Working with Corporation of Chennai

D) Working with Health Department

E) Blind assistance

F) Garments collection

G) Non-formal education

H) 'Environmental Education, Awareness and Training (EEAT)'

I) Blood donation.

**REFERENCE BOOKS**

1) National Service Scheme Manual, Government of India, 2006.
2) Training Programme on National Programme Scheme, TISS.
3) Orientation Courses for N.S.S. Programme Officers, TISS.
4) Case material as Training Aid for Field Workers, Gurmeet Hans.
5) Social Service Opportunities in Hospitals, KapilK. Krishan, TISS.
6) Social Problems in India, Ram Ahuja.

| 00OEXX | HUMAN RIGHTS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES**

At the end of this course the student is expected to understand what is human rights, how to obey the rights, what is the role of a human being in making a good society for the future generations.

**Unit–I**

Definition of Human Rights - Nature, Content, Legitimacy and Priority - Theories on Human.

Rights - Historical Development of Human Rights.

**Unit–II**

International Human Rights - Prescription and Enforcement upto World War II - Human Rights and the U .N .O. - Universal Declaration of Human Rights - International Covenant on Civil and Political Rights - International Convenant on Economic, Social and Cultural Rights and Optional Protocol.

**Unit–III**

Human Rights Declarations - U.N. Human Rights Declarations - U.N. Human Commissioner.

**Unit–IV**

Amnesty International - Human Rights and Helsinki Process - Regional Developments -European Human Rights System - African Human Rights System - International Human Rights in Domestic courts.

**Unit–V**

Contemporary Issues on Human Rights: Children's Rights - Women's Rights - Dalit's Rights - Bonded Labour and Wages - Refugees - Capital Punishment. Fundamental Rights in the Indian Constitution - Directive Principles of State Policy - Fundamental Duties - National Human Rights Commission.

**TEXT BOOKS**

1) Desai, A.R. Violation of Democratic Rights in India, Sage Publishers, 1986.
2) S. Hick, E. Halpin and E. Hoskins, Human Rights and the Internet, Springer Publishers, 2000.

**REFERENCE BOOKS**

1) International Bill of Human Rights, Amnesty International Publication, London, 1988.
2) Human Rights, Questions and Answers, UNESCO, 1982.
3) Mausice Cranston, What is Human Rights.
4) Timm. R.W. Working for Justice and Human Rights.
5) Human Rights, A Selected Bibliography, USIS.
6) Cheous K., (Ed). Social Justice and Human Rights (Vols 1-7).
7) Devasia, V.V., Human Rights and Victimology.