# ACADEMIC REGULATIONS

# COURSE STRUCTURE AND

# DETAILED SYLLABUS

## Electrical and Electronics Engineering

### B.TECH. FOUR YEAR DEGREE COURSE

### (Applicable for the batches admitted from 2015-2016)


**VALLURUPALLI NAGESWARA RAO VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY**

An Autonomous Institute, Accredited by NAAC with 'A' Grade
NBA Accreditation for CE, EEE, ME, ECE, CSE, EIE, IT B.Tech. Programmes
Approved by AICTE, New Delhi, Affiliated to JNTUH
Recognized as "College with Potential for Excellence" by UGC
Vignana Jyothi Nagar, Pragathi Nagar, Nizampet (S.O), Hyderabad – 500 090, TS, India.
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## Vision and Mission of the Institute

# VISION

To be a World Class University providing value-based education, conducting interdisciplinary research in cutting edge technologies leading to sustainable socio-economic development of the nation.

# MISSION

- To produce technically competent and socially responsible engineers, managers and entrepreneurs, who will be future ready.
- To involve students and faculty in innovative research projects linked with industry, academic and research institutions in India and abroad.
- To use modern pedagogy for improving the teaching-learning process.

## Vision and Mission of the Department

# VISION

To excel in Education, Technology and Research in Electrical and Electronics Engineering leading to sustainable socioeconomic development of the nation.

# MISSION

- Excellent teaching learning environment imbibed with professional ethics and social responsibility in promoting quality education.
- Promoting research through industry collaborations and innovative projects.

**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**HYDERABAD**

***An Autonomous Institute***

**ACADEMIC REGULATIONS FOR B.TECH. PROGRAMME**

(Applicable for students admitted from the academic year 2015-2016)

## 1. Programmes of Study

- The following four year B.Tech. degree programmes of study are offered at VNR VJIET from the academic year 2017-2018.

| Branch Code | Branch |
|---|---|
| 01 | Civil Engineering |
| 02 | Electrical and Electronics Engineering |
| 03 | Mechanical Engineering |
| 04 | Electronics and Communication Engineering |
| 05 | Computer Science and Engineering |
| 10 | Electronics and Instrumentation Engineering |
| 12 | Information Technology |
| 24 | Automobile Engineering |

- **'ENGLISH'** language is used as the medium of instruction in all the above programmes.

### 1.1 Eligibility Criteria for Admission

The eligibility criteria for admission into engineering programmes shall be as mentioned below:

- The candidate shall be an Indian National / NRI
- The candidate should have completed 16 years of age as on 31st December of the academic year for which the admissions are being conducted
- The candidate should have passed the qualifying examination (10+2) or equivalent as on the date of admission recognized by BIE, Telangana State

**1.1.1** Seats in each programme in the Institution are classified into **Category A** and **Category B** as per the G.Os.

**Category – A Seats:**
These seats shall be filled through counseling as per the rank in the Common Entrance Test (EAMCET) conducted by the State Government and as per other admission criteria laid down in the G.Os.

**Category - B Seats:**
These seats shall be filled by the Institute as per the G.Os issued by the State Government from time to time.

**1.1.2 Category: Lateral Entry**
The candidate shall be admitted into the Third Semester, ($2^{nd}$ year, $1^{st}$ semester) based on the rank secured by the candidate in Engineering Common Entrance Test (ECET (FDH)) by the Convener, ECET.

**2. Distribution and Weights of Marks**

**i.** The performance of a student in each semester shall be evaluated subject –wise with **a maximum of 100 marks for theory and 100 marks for practical subjects.** In addition, an Industry oriented mini-project, seminar, comprehensive viva-voce and project work shall be evaluated for **100, 100, 100 and 200 marks** respectively.

**ii.** For theory subjects, the distribution shall be **40 marks for Mid-term Evaluation** and **60 marks for the Semester End Examination**.

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**Mid-Term Evaluation (40 M):**
Mid-term evaluation consists of mid-term examination (30 M) and assignment/test (10 M).

- **Mid-term examination (30 M):**

- For theory subjects, two mid examinations shall be conducted in each semester as per the academic calendar. Each mid examination shall be evaluated for 30 marks.
  PART-A 3 X 2M = 6 M (one question from each UNIT)
  PART-B 3 X 8 M = 24 M (three internal choice questions one from each UNIT shall be given, the student has to answer one question from each UNIT)
- 80 % weightage for better mid-term examination and 20% weightage for the other mid examination shall be used and calculated as the final mid-term examination marks for each subject.

- **Assignment/objective exam/ case study/course project (10 M):**

- Two assignment/objective exam/ case study/course project shall be given to the students covering the syllabus of First Mid and Second Mid Examinations respectively and evaluated for 10 marks each.
- The first assignment shall be submitted before first mid examination and second assignment shall be submitted before second mid examination.
- The average of 2 assignments shall be taken as final assignment marks.

**iii.** For practical subjects, there shall be a **continuous evaluation during the semester for 40 marks and 60 marks for semester end examination**. Out of the 40 marks, **day-to-day work in the laboratory shall be evaluated for 10**

**marks**, and **15 marks for practical examination** and **15 marks for laboratory record.**

**NOTE: 1. Any student who shall remain absent for any assignment/Mid-term examination for any reason what so ever, shall be deemed to have secured 'zero' marks in the test/examination and no makeup test/examination shall be conducted.**

**2**. Evaluation guidelines available with respective HOD's.

**iv.** For the subjects having design and / or drawing, (such as Engineering Graphics, Geometrical Drawing, Machine Drawing, Production Drawing Practice, and Estimation etc.,) the distribution shall be **40 marks for internal evaluation (20 marks for day-to-day work and 20 marks for Mid examination (**the average of the two examinations shall be taken into account**) and 60 marks for semester end examination.**

**NOTE:** Evaluation guidelines available with respective HOD's.

**v.** There shall be an **industry-oriented mini-project**, in collaboration with an industry of their specialization, to be taken up during the summer vacation after III year II semester examination. The **industry oriented mini project shall be evaluated during the IV year I semester.** The industry oriented mini project shall be submitted in report form and presented before a committee, which shall evaluate it for **100 marks.** The committee shall consist of Head of the Department, the supervisor of mini project and a senior faculty member of the department. There shall be **no mid-term assessment for industry oriented mini project. However, attending the shadow engineering program or any such other programme, in lieu thereof, is a pre-requisite for evaluating industry-oriented mini project.**

**NOTE:** Evaluation guidelines available with respective HOD's.

**vi.** There shall be a **seminar presentation in IV year II semester**. For the seminar, the student shall collect the information on a specialized topic other than the project topic and prepare a technical report, showing his understanding of the topic, and submit to the department, which shall be evaluated by a departmental committee consisting of the Head of the department, seminar supervisor and a senior faculty member. **The seminar shall be evaluated for 100 marks based on the report and presentation made.**

**NOTE:** Evaluation guidelines available with respective HOD's.

**vii.** There shall be a **comprehensive viva-voce in IV year II semester**. The comprehensive viva-voce shall be conducted by a committee consisting of the Head of the Department and three senior faculty members of the Department **after submitting the filled and duly signed M.T.P record**. The comprehensive viva-voce is aimed to assess the student's understanding in various subjects studied during the B.Tech. programme of study. The comprehensive viva-voce shall be evaluated **for 100 marks** by the committee. There shall be **no Mid-term assessment for the comprehensive viva-voce.**

**Evaluation:-**

a. Objective type examination – 50 marks. (Two hours test)
b. Committee evaluation – 50 marks.

**NOTE:** Evaluation guidelines available with respective HOD's

**viii.** The **project work** shall be started by the student in the beginning of the IV year I semester. Out of a total of **200 marks** for the project work, **80 marks shall be for mid-term evaluation** and **120 marks for the semester end examination**. The viva-voce shall be conducted by a committee comprising an external examiner, Head of the Department, the project supervisor and one senior faculty. The evaluation of project work shall be conducted at the end of the IV year II Semester. **The mid-term evaluation shall be on the basis of three seminars conducted during the IV year II semester for 80 marks by the committee consisting of Head of the Department, project supervisor and senior faculty member of the Department.**

**NOTE:** Evaluation guidelines available with respective HOD's

**3. Semester End Examination (60 M):**

**(a) Theory Courses**

Question paper pattern for semester end examination (60 Marks) consists of two sections i.e., Part-A and Part-B.

**PART-A:**

- Shall consist of 10 questions of 02 marks each. (10X2M = 20M)
- There shall be 02 questions from each unit.
- All the questions are compulsory.

**PART-B:**

- Shall consist of 05 questions of 08 marks each. (05X8M = 40M)
- There shall be 01 question from each unit with internal choice.

**(b) Practical Courses**

Each laboratory course shall be evaluated for 60 marks. The semester end examination shall be conducted by two examiners, one Internal and other external concerned with the subject of the same / other department / Industry. The evaluation shall be as per the standard format.

**(c) Supplementary Examinations**

Supplementary examinations shall be conducted along with regular semester end examinations. (During even semester regular examinations, supplementary examinations of odd semester and during odd semester regular examinations, supplementary examinations of even semester shall be conducted).

**4. Attendance Requirements**

i. A student shall be eligible to appear for the semester end examinations if he / she acquire a **minimum of 75% of attendance in aggregate of all the courses** in that semester.

ii. Shortage of attendance in aggregate **up to 10% (attendance of 65% and above and below 75%)** in a semester may be condoned by the **Institute Academic**

**Committee based on the rules prescribed by the Academic Council of the Institute from time to time.**

iii. A student shall not be permitted to write the semester end examination and not promoted to the next semester unless he/she satisfies the attendance requirement of the present semester, as applicable. He/She may seek re-admission for that semester when offered next, if not promoted to the next semester.

iv. **Shortage of attendance below 65% in aggregate shall in NO case be condoned.**

v. Students whose shortage of attendance is not condoned or who have not paid the stipulated fee or who have not cleared any other due to the Institute in any semester are not eligible to writer semester end examination of that semester.

**5. Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in Regulation No.4**.**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing subject or project, if he/she secures **not less than 35% (21 out of 60 marks) of marks in the semester end examination and a minimum of 40% of marks in the sum total of the mid-term evaluation and semester end examination taken together.**

ii. For promotion from II year II semester to III year I semester, the student needs to have 50% of credits up to II year II semester which includes

- Two regular and two supplementary examinations of I B Tech. I semester.
- Two regular and one supplementary examinations of I B Tech. II semester
- One regular and one supplementary examinations of II year I semester.
- One regular examinations of II year II semester.

iii. For promotion from III year II semester to IV year I semester, the student needs to have 50% of credits up to III year II semester which includes

- Three regular and three supplementary examinations of I B Tech. I semester.
- Three regular and two supplementary examinations of I B Tech. II semester
- Two regular and two supplementary examinations of II year I semester.
- Two regular and one supplementary examinations of II year II semester.
- One regular and one supplementary examination of III year I semester.
- One regular examination of III year II semester.

iv. A student shall register and put up minimum academic requirement in all **188 credits and earn atleast 180 credits for the award of B.Tech. degree.** The grade obtained for the minimum credits shall be considered for the calculation of CGPA.

v. The students shall take one open elective subject each from the lists given in open elective-1 and open elective-2. The selected subjects shall not belong to their own branch.

vi. The student shall be qualified in **two certificate courses** during his/her course of study.

vii. "Gender Sensitization" is compulsory value added course as per the JNTUH procds. No. A1/2557/XXII SCAS/2015(2), dated 19.11.2015.

viii. Students who fail to earn atleast 180 credits as indicated in the course structure **within eight academic years counting** from the year of their admission shall **forfeit their seat** in B.Tech. programme and their **admission stands cancelled.**

**6. Course pattern**

i. The entire programme of study is of four academic years. **All I, II, III and IV years are of semester pattern.**

ii. A student eligible to appear for the semester end examination in a subject, but absent or has failed in the semester end examination may reappear for that subject in the supplementary examination whenever conducted.

iii. When a student is detained due to shortage of attendance in any semester, he/she shall seek readmission into that semester when it is offered next, **with the academic regulations of the batch into which he/she gets readmitted and has to obtain the degree within 8 academic years from the year of his/her original admission.**

iv. When a student is detained due to lack of credits in any year, he/she may be eligible for promotion to the next year after obtaining the required number of credits and fulfillment of the academic requirements.

**7. Award of B.Tech. Degree and Class**

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

i. Pursued **a programme of study for not less than four academic years and not more than eight academic years.**

ii. Registered for **188 credits** and secured a minimum of **180 credits with compulsory subjects as listed in the following Table.**

**Table: Compulsory Courses**

| S. No. | Courses Particulars |
|---|---|
| 1. | All Practical Courses |
| 2. | Industry oriented mini project |
| 3. | Comprehensive Viva-Voce |
| 4. | Seminar |
| 5. | Project work |
| 6. | Engineering Graphics / Engineering Drawing / Machine Drawing |

***NOTE: Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. programme.***

**8. CGPA System:**

Method of awarding absolute grades and grade points in four year B.Tech. degree programme is as follows:

- Absolute Grading Method is followed, based on the total marks obtained in mid-term and semester end examinations.
- Grades and Grade points are assigned as given below.

| Marks Obtained | Grade | Description of Grade | Grade Points(GP) Value Per Credit |
|---|---|---|---|
| >=90 | O | Outstanding | 10.00 |
| >=80 and <89.99 | A+ | Excellent | 9.00 |
| >=70 and <79.99 | A | Very Good | 8.00 |
| >=60 and <69.99 | B | Good | 7.00 |
| >=50 and <59.99 | C | Fair | 6.00 |
| >=40 and <49.99 | D | Pass | 5.00 |
| <40 | F | Fail | |
| Not Appeared the Exam(s) | N | Absent | |

- **The student is eligible for the award of the B.Tech. degree with the class as mentioned in the following table.**

| CGPA | Class |
|---|---|
| >= 7.5 | First Class with Distinction |
| >= 6.5 and <7.5 | First Class |
| >= 5.5 and < 6.5 | Second Class |
| >=5.0 and < 5.5 | Pass Class |

➢ **Calculation of Semester Grade Points Average (SGPA):**

The performance of each student at the end of the each semester shall be indicated in terms of SGPA. The SGPA shall be calculated as below:

$$\mathbf{SGPA} = \frac{\textbf{Total earned weighted grade points in a semester}}{\textbf{Total credits in a semester}}$$

$$\mathbf{SGPA} = \frac{\sum_{i=1}^{p} \mathbf{C_i} * \mathbf{G_i}}{\sum_{i=1}^{p} \mathbf{C_i}}$$

Where Ci = Number of credits allotted to a particular subject 'i'

Gi = Grade point corresponding to the letter grade awarded to the subject 'i'

i = 1,2,…..p represent the number of subjects in a particular semester

**Note: SGPA is calculated and awarded for the candidates who pass all the courses in a semester.**

- **Calculation of Cumulative Grade Point Average (CGPA):**

  **The CGPA of a student for the entire programme shall be calculated as given below:**

  - Assessment of the overall performance of a student shall be obtained by calculating Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained in all subjects during the course of study.

$$\mathbf{CGPA} = \frac{\textbf{Total earned weighted grade points for the entire programme}}{\textbf{Total credits for the entire programme}}$$

$$\mathbf{CGPA} = \frac{\sum_{j=1}^{m} \mathbf{C_j} * \mathbf{G_j}}{\sum_{j=1}^{m} \mathbf{C_j}}$$

Where Cj = Number of credits allotted to a particular subject 'j'

Gj = Grade Point corresponding to the letter grade awarded to that subject 'j'

j = 1,2,….m represent the number of subjects of the entire program.

  - Grade lower than D in any subject shall not be considered for CGPA calculation. The CGPA shall be awarded only when the student acquires the required number of credits prescribed for the program.

- **Grade Card**

  The grade card issued shall contain the following:

  a) The credits for each subject offered in that semester

  b) The letter grade and grade point awarded in each subject

  c) The **SGPA/CGPA**

  d) Total number of credits earned by the student up to the end of that semester.

**9. Withholding of Results**

If the student has not paid dues to the Institute, or if any case of indiscipline is pending against him, the result of the candidate may be withheld. The award or issue of the Provisional Certificate and the Degree may also be withheld in such cases.

**10. Transitory Regulations**

Students who have discontinued or have been detained for want of attendance or any other academic requirements, may be considered for readmission as and when they become eligible. They have to take up Equivalent subjects, as substitute subjects in place of repeated subjects as decided by the Chairman of the BoS of the respective departments. He/She shall be admitted under the regulation of the batch in which he/she is readmitted.

**11. Minimum Instruction Days**

The minimum instruction days for each semester shall be **90 instruction days.**

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

**13. The decision of the Institute Academic Committee shall be final in respect of equivalent subjects for those students who are transferred from other colleges. The transfer of students from other college or from this institute is to be approved by the Governing Council of the Institute.**

**14. General**

i. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

ii. The academic regulations should be read as a whole for the purpose of any interpretation.

iii. In the case of any discrepancy/ambiguity/doubt arising in the above rules and regulations, the decision of the Principal shall be final.

iv. The Chairman Academic Council may change or amend any or all of the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students concerned with effect from the dates notified by the College.

**15. Academic Regulations for B.Tech. (Lateral Entry Scheme)**

(Applicable for students admitted from the academic year 2016-2017)

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

**i.** Pursued **a programme of study for not less than three academic years and not more than six academic years.**

**ii.** Registered for **138 credits** and secured a minimum of **130 credits with compulsory subjects as listed in the following Table.**

**Table: Compulsory Courses**

| S. No. | Courses Particulars |
|---|---|
| 1. | All Practical Courses |
| 2. | Industry oriented mini project |
| 3. | Comprehensive Viva-Voce |
| 4. | Seminar |
| 5. | Project work |
| 6. | Engineering Graphics / Engineering Drawing / Machine Drawing |

iii. A student who **fails to earn a minimum of 130 credits** as indicated in the course structure **within six academic years** from the year of their admission shall **forfeit his/her seat in B.Tech. programme and his admission stands cancelled.**

iv. The same attendance regulations are adopted as that of B.Tech. four year degree course.

v. For promotion from III year II semester to IV year I semester, the student needs to have 50% of credits up to III year II semester which includes

- Two regular and two supplementary examinations of II B Tech. I semester
- Two regular and one supplementary examinations of II B Tech. II semester
- One regular and one supplementary examinations of III B.Tech. I semester
- One regular of examinations of III year II semester

vi. All other regulations as applicable to B.Tech. four year degree course shall hold good for B.Tech. (Lateral Entry Scheme).

**16. Malpractice Rules**

Disciplinary Action for Malpractices/Improper Conduct in Examinations

| S. No. | Nature of Malpractices / Improper conduct | Punishment |
|---|---|---|
| | **If the candidate:** | |
| 1. | (a) Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. |
| | (b)Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is |

| | | |
|---|---|---|
| | | to be cancelled. |
| 3. | Impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he shall be handed over to the police and a case is registered against him. |
| 4. | Smuggles the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester and supplementary examinations The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that subject. |
| 6. | Refuses to obey the orders of the Chief Superintendent/Assistant– Superintendent / any officer on duty or misbehaves or creates disturbance of | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject |

| | | |
|---|---|---|
| | any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates are also debarred and they shall forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them. |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester examinations including supplementary Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 8. | Possesses any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. |

| | | |
|---|---|---|
| 9. | If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in any of clauses 6 to 8. | If the student belongs to the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.<br>Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them. |
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that series of the semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year. |
| 12. | If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the academic council of the Institute for further action to award suitable punishment. | |

**Malpractices identified by squad or special invigilators**

Punishments shall be given to the candidates as per the above guidelines.

**Malpractice identified at Spot center during valuation**

The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center.

1) Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee shall meet and discuss/question the candidate and based on the evidences, the committee shall recommend suitable action on the candidate.

2) A notice is to be served to the candidate(s) involved, through the Principal, to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.

3) The involvement of staff who are in charge of conducting examinations, invigilators, examiners valuing examination papers and preparing / keeping records of documents related to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommend for award of appropriate punishment after thorough enquiry.

4) Based on the explanation by the party involved and recommendations of the committee action may be initiated.

**5) Malpractice committee:**

| | | |
|---|---|---|
| i. | Dean, Academics | Chairman |
| ii. | Controller of Examinations | Convener |
| iii. | Invigilator | Member |
| iv. | Chief Examiner of the subject/subject expert | Member |
| v. | Concerned Head of the Department | Member |

**Program Educational Objectives (PEOs):**

The Graduates of Electrical and Electronics Engineering program will

I. Excel in chosen career and/or higher education with technical competence
II. Demonstrate multidisciplinary skills and professional ethics in relating engineering issues to broader societal context
III. Work effectively as an individual and team member with good managerial and communication skills
IV. Engage in lifelong learning to maintain and enhance professional skills

**Program Outcomes (POs):**

The graduate will be able to

a. Apply mathematics, basic sciences and electrical engineering fundamentals to solve technical problems with the background of multi-disciplinary knowledge.
b. Identify, formulate, research literature and analyze complex electrical and electronics engineering problems attaining reasonable conclusions using fundamentals of mathematics, basic and engineering sciences.
c. Design solutions for complex electrical and electronics engineering problems and the process to attain the specified solutions with societal, environmental and safety considerations
d. Bring out alternate solutions using research based knowledge and methodology
e. Create, select and apply modern tools to carryout complex electrical and electronics engineering activities with an understanding of the limitations
f. Apply contextual knowledge in professional engineering practice to enhance the society in the aspects of economy, health, safety, legal and culture.
g. Understand the impact of engineering solutions on the environment to mitigate any ill effects and ensure sustainability of the solutions arrived.
h. Apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice
i. Function effectively as an individual and as a member or leader in diverse and multi disciplinary teams
j. Communicate effectively on complex engineering activities with the engineering community and with society at large
k. Administer and regulate projects subjected to financial personnel and time constraints
l. Engage in lifelong learning to adopt or develop the technological advancements to meet the growing and changing societal needs

**VNR Vignana Jyothi Institute of Engineering & Technology**
**B. TECH ELECTRICAL & ELECTRONICS ENGINEERING**
**Regulations- R15**

**I YEAR I SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | T/P/D | Credits |
|---|---|---|---|---|
| 5BS11 | Advanced Calculus | 3 | 0 | 3 |
| 5BS21 | Engineering Physics | 3 | 0 | 3 |
| 5CS01 | Computer Programming | 3 | 1 | 4 |
| 5BS01 | English | 3 | 0 | 3 |
| 5CE03 | Environmental Studies | 3 | 0 | 3 |
| 5ME19 | Engineering Drawing | 2 | 4 | 4 |
| 5BS02 | English Language Communication Skills Laboratory | 0 | 3 | 2 |
| 5CS51 | Computer Programming Laboratory | 0 | 3 | 2 |
| 5ME53 | IT and Engineering Workshop | 0 | 3 | 2 |
| **Total** | | **17** | **14** | **26** |

**I YEAR II SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | T/P/D | Credits |
|---|---|---|---|---|
| 5BS12 | Ordinary Differential Equations and Laplace Transforms | 3 | 0 | 3 |
| 5BS13 | Computational methods | 3 | 0 | 3 |
| 5EE01 | Circuit Theory | 3 | 1 | 4 |
| 5BS23 | Advanced Engineering Physics | 3 | 0 | 3 |
| 5BS32 | Engineering Chemistry | 3 | 0 | 3 |
| 5IT02 | Data Structures | 3 | 1 | 4 |
| 5BS25 | Engineering Physics and Engineering Chemistry Laboratory | 0 | 3 | 2 |
| 5IT52 | Data Structures Laboratory | 0 | 3 | 2 |
| **Total** | | **18** | **8** | **24** |

*** T/P/D: Tutorial/Practical/Drawing Practice**

**VNR Vignana Jyothi Institute of Engineering and Technology**

**B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING**

**II YEAR I SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | *T/P/D | Credits |
|---|---|---|---|---|
| 5BS14 | Partial Differential Equations with Applications and Complex Analysis | 3 | 0 | 3 |
| 5EC01 | Electronic Devices and Circuits | 3 | 1 | 4 |
| 5EE02 | Network Analysis | 3 | 0 | 3 |
| 5EE03 | Electro Magnetic Field Theory | 3 | 1 | 4 |
| 5EE04 | Electrical Machines-I | 3 | 0 | 3 |
| 5EC03 | Switching Theory and Logic Design | 3 | 0 | 3 |
| 5EE51 | Electrical Circuits and Simulation Laboratory | 0 | 3 | 2 |
| 5EC51 | Electronic Devices and Circuits Laboratory | 0 | 3 | 2 |
| **Total** | | **18** | **8** | **24** |
| #5BS04 | Gender Sensitization # | - | 3 | 2 |

**II YEAR II SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | *T/P/D | Credits |
|---|---|---|---|---|
| 5EE05 | Electrical Machines – II | 3 | 1 | 4 |
| 5EC16 | Electronic Circuits | 3 | 0 | 3 |
| 5BS41 | Business Economics and Financial Analysis | 3 | 0 | 3 |
| 5EE06 | Power Systems-I | 3 | 0 | 3 |
| 5ME25 | Fluid Mechanics and Hydraulic Machines | 3 | 0 | 3 |
| 5EE52 | Electrical Machines - I Laboratory | 0 | 3 | 2 |
| 5EC61 | Electronic Circuits Laboratory | 0 | 3 | 2 |
| 5ME69 | Fluid Mechanics and Hydraulic Machines Laboratory | 0 | 3 | 2 |
| **Total** | | **15** | **10** | **22** |

**#Value added Course**

*** T/P/D: Tutorial/Practical/Drawing Practice**

**VNR Vignana Jyothi Institute of Engineering and Technology**
**B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING**

**III YEAR I SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | *T/P/D | Credits |
|---|---|---|---|---|
| 5EE07 | Electrical Machines – III | 3 | 0 | 3 |
| 5EE08 | Control Systems | 3 | 1 | 4 |
| 5EE09 | Power Systems-II | 3 | 0 | 3 |
| 5EE10 | Power Electronics | 3 | 1 | 4 |
| | OPEN ELECTIVE 1 | 3 | 0 | 3 |
| 5EE53 | Electrical Machines –II Laboratory | 0 | 3 | 2 |
| 5EE54 | Control Systems and Simulation Laboratory | 0 | 3 | 2 |
| 5EE55 | Power Electronics and Simulation Laboratory | 0 | 3 | 2 |
| **Total** | | **15** | **11** | **23** |

**Open Elective - I**

| Course Code | Course Name | Course Offered By the Department |
|---|---|---|
| 5CE71 | Disaster Management | CE |
| 5EE71 | Renewable Energy Technologies | EEE |
| 5ME71 | Digital Fabrication | ME |
| 5EC71 | Principles of Electronic Communications | ECE |
| 5CS71 | Object Oriented Programming through Java | CSE |
| 5EI71 | Principles of Measurements and Instrumentation | EIE |
| 5IT71 | Cyber Security | IT |
| 5AE71 | Principles of Automobile Engineering | AE |
| 5BS71 | Professional Ethics and Human Values | H&S |

**VNR Vignana Jyothi Institute of Engineering and Technology**
**B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING**

**III YEAR II SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | T/P/D | Credits |
|---|---|---|---|---|
| 5EE11 | Power Semi Conductor Drives | 3 | 0 | 3 |
| 5EE12 | Power System Analysis | 3 | 1 | 4 |
| 5EI06 | Linear and Digital IC Applications | 3 | 0 | 3 |
| 5EC09 | Microprocessors and Micro Controllers | 3 | 0 | 3 |
| | OPEN ELECTIVE II | 3 | 0 | 3 |
| 5EE56 | Power Systems Laboratory | 0 | 3 | 2 |
| 5EC56 | Microprocessors and Microcontrollers Laboratory | 0 | 3 | 2 |
| 5BS03 | Advanced English Communication Skills Laboratory | 0 | 3 | 2 |
| **Total** | | **15** | **10** | **22** |

**Open Elective - II**

| Course Code | Course Name | Course Offered By the Department |
|---|---|---|
| 5CE72 | Introduction to Geographical Information System | CE |
| 5EE72 | Energy Auditing Conservation and Management | EEE |
| 5ME72 | Optimization Techniques | ME |
| 5EC72 | Introduction to Micro Processors and Controllers | ECE |
| 5EC95 | Wireless Communications and Networks | ECE |
| 5CS72 | Open Source Technologies | CSE |
| 5EI72 | LabVIEW Programming | EIE |
| 5EI79 | Fundamentals of Robotics | EIE |
| 5IT72 | Relational Database Management Systems | IT |
| 5AE72 | Modern Automotive Technologies | AE |
| 5BS72 | Entrepreneurship | H&S |

**VNR Vignana Jyothi Institute of Engineering and Technology**
**B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING**

**IV YEAR I SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | T/P/D | Credits |
|---|---|---|---|---|
| 5EE13 | Electrical Measurements and Instrumentation | 3 | 0 | 3 |
| 5EE14 | Power System Operation and control | 3 | 0 | 3 |
| 5EC17 | Principles of Digital Signal Processing | 3 | 0 | 3 |
| 5EE15 | Switchgear and Protection | 3 | 0 | 3 |
| **ELECTIVE-I** | | 3 | 0 | 3 |
| 5EE73 | Advanced Control Systems | | | |
| 5EE74 | Modern Power Electronics | | | |
| 5EE75 | Renewable Power Generation Technologies | | | |
| 5EC86 | Basics of Nano Science and Technology | | | |
| **ELECTIVE-II** | | 3 | 0 | 3 |
| 5EE76 | High Voltage Engineering | | | |
| 5EE77 | Electrical Distribution Systems and Automation | | | |
| 5EE80 | Artificial Neural Networks and Fuzzy Logic | | | |
| 5EC79 | Internet of Things | | | |
| 5EE57 | Electrical Measurements and Instrumentation Laboratory | 0 | 3 | 2 |
| 5EC62 | Principles of Digital Signal Processing Laboratory | 0 | 3 | 2 |
| 5EE91 | Industry Oriented Mini Project | 0 | 4 | 2 |
| **Total** | | **18** | **10** | **24** |

*** T/P/D: Tutorial/Practical/Drawing Practice**

**VNR Vignana Jyothi Institute of Engineering and Technology**
**B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING**

**IV YEAR II SEMESTER** **COURSE STRUCTURE**

| Course Code | Course Name | Lectures | T/P/D | Credits |
|---|---|---|---|---|
| 5BS42 | Management Science | 3 | 0 | 3 |
| **Elective – III** | | 3 | 0 | 3 |
| 5EE81 | HVDC Transmission | | | |
| 5EC12 | VLSI Design | | | |
| 5EI81 | Programmable Logic Controllers | | | |
| 5EE82 | Reliability Engineering and Applications to Power systems | | | |
| **Elective – IV** | | 3 | 0 | 3 |
| 5EE83 | Utilization of Electrical Energy | | | |
| 5EE84 | Flexible A.C. Transmission Systems | | | |
| 5EC14 | Embedded Real Time Operating Systems | | | |
| 5EE85 | Smart Electric Grid | | | |
| 5EE92 | Technical Seminar | 0 | 3 | 2 |
| 5EE93 | Comprehensive Viva Voce | 0 | 0 | 2 |
| 5EE94 | Project Work | 0 | 20 | 10 |
| **Total** | | **9** | **23** | **23** |

* T/P/D: Tutorial/Practical/Drawing Practice

**VNR Vignana Jyothi Institute of Engineering & Technology**

| **I Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
|---|---|---|---|
| | **3** | **0** | **3** |

## (5BS11)ADVANCED CALCULUS

(Common for all Branches)

**Course prerequisites**: Differentiation, Integration

**Course Objectives**:

- Understand the Taylor's theorem and its application to maxima and minima of f(x,y)
- Understand the process of curve Tracing.
- Understand multiple integrals and its applications
- Apply integral theorems of vector calculus.

**Learning Outcomes**:

Students will be able to

- Solve problems involving the maxima and minima of f(x,y).
- Trace curvesusing basic characteristics.
- Evaluate integrals using special functions and change of variables.
- Evaluate vector integrals.

**UNIT I**

**Calculus of One and Several Real Variables:**

Mean value theorems **–** Role's Theorem, Lagrange's Mean value theorem Cauchy's Mean value theorem **,** Taylor's expansion and McLaurin's expansion of functions (without proofs).

Partial differentiation, partial derivatives of first and second order in terms of partial derivatives, change of variables , Jacobian, Taylor's theorem of two variables(without proof). Maxima and Minima of two variables, Langrange's method of undetermined multipliers.

**UNIT II**

**Curve Tracing and Related Applications:**

Radius of Curvature of curves in Cartesian, parametric and polar coordinates. Tracing of curves in Cartesian, parametric and polar coordinates (like conics, astroid, hypocycloid, Folium of Descartes, Cycloid, Circle, Cardiode, Lemniscate).

**UNIT III**

**Multiple Integrals:**

Beta, Gamma and Error functions, Introduction of Multiple integrals , evaluation of double and triple integrals, change of order of integration change of variables , Cylindrical and Spherical polar coordinates.

**UNIT IV**

**Vector Differential Calculus:**

Scalar and Vector point functions, Gradient, Divergence, Curl with geometrical & physical interpretation, Directional derivatives, vector identities (without proofs).

**UNIT V**

**Vector Integral Calculus:**

Line integrals and application to Work done and Circulation, Scalar potential function, Surface integrals and Volume integrals, Gauss divergence theorem, Green's theorem , Stokes' theorem (theorems without proof).

**TEXT BOOKS:**

1. Higher Engineering Mathematics – by B. S. Grewal,*Khanna publishers*
2. Calculus and Analytic Geometry *by* Thomas and Finney, 9th edition; *Publisher: Pearson Education*.

**REFERENCES :**

1. Advanced Engineering Mathematics *by* Erwin Kreyszig, 8th edition; *Publisher: John Wiley*.
2. Advanced Engineering Mathematics by Peter 'O' Neil, publisher: Cengage Learning .
3. Advanced Engineering Mathematics *by R.K.Jain and S.R.K.Iyengar; Narosa Publications*

| I Year B.Tech EEE – I Sem | L | T/P/D | C |
|---|---|---|---|
| | 3 | 0 | 3 |

**(5BS21)ENGINEERING PHYSICS**

(Common for all Branches)

**Course Objectives**

- To supplement and enhance the knowledge of basic concepts in physics essentially required in the study of interaction of light with matter and behavior of a particle quantum mechanically.
- To Study and understand various phenomena of light- Interference, Diffraction, Dispersion and total internal reflection.
- To learn and enhance the basic concepts in physics required to deal with large number of particles and behavior of an electron in metals.
- To understand the basic principles and working of lasers and optical fibers.
- To learn simple applications of these concepts and principles in engineering and technology**.**

**Course Outcomes:**

After completion of the course the student is able to

- realize influence of diffraction and resolvability in optical elements. recognize importance of interference in thin films.
- distinguish LASER light from ordinary light and describe propagation of light through Optical fiber by Total Internal reflection.
- illustrate behavior of a particle in one dimensional potential box.
- understand behavior of electron in a periodic potential in real crystal and classify Solids based on conduction**.**

**UNIT I**

**INTERFERENCE:**

Introduction, Superposition principle, Resultant amplitude, Coherence - Methods to obtain coherent sources, Interference, Young's Double Slit Experiment, interference thin films by reflection, Newton's rings Experiment-Formation of Rings and Experimental Method, Characteristics of rings, Applications.

**UNIT II**

**DIFFRACTION**:

Introduction, Distinguish between Fraunhofer and Fresnel diffraction, diffraction at single slit (Phasors approach). Diffraction at double slit, circular aperture, and multiple slits (grating)( Qualitative Approach)-Width of Principal Maxima and Dispersion, Resolution of spectral lines, Rayleigh criterion, and resolving power of grating.

**UNIT III**

**LASERS AND OPTICAL FIBERS:**

Introduction, Characteristics of Lasers, Spontaneous and Stimulated Emission of radiation, Meta stable state, population inversion, lasing action, Einstein's coefficients and relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Laser,Principle of optical fiber and Properties, Acceptance angle and acceptance cone, Numerical aperture, Types of fibers based on refractive index profiles, Qualitative analysis of attenuation in optical fibers, Application of Lasers and Optical fibers.

**UNIT IV**

**ELEMENTS OF QUANTUM MECHANICS**:

Waves and particles, De Broglie hypothesis, Matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle- Applying it to Non existence of electron in Nucleus and Single slit Experiment, Schrodinger Wave Equation – Wave function and its Physical Significance, Particle in one dimensional potential box(wave functions, probability densities and energy states), Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (non-mathematical treatment).

**UNIT V**

**ELECTRON THEORY OF METALS**:

Energy levels in one dimension, Effect of temperature on the Fermi-Dirac distribution, Electrical conductivity & Ohm's law, Electrical Resistivity of Metals (Qualitative), Electron in a periodic potential, Bloch Theorem, Kronig-Penney model (non-mathematical treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors & Insulators and Concept of effective mass of an electron.

**TEXT BOOKS:**


1. Physics vol.2, by Halliday, Resnick and Krane; John Wiley & Sons
2. Engineering Physics by R.K.Gaur and S.L.Gupta; Dhanpat Rai and Sons


**REFERENCES:**


1. Optics by Ghatak and Thyagarajan, Tata Mc Graw
2. Concepts of Modern physics by Arthur Beiser, McGraw Hill Inc.
3. Introduction to Solid State Physics by Charles Kittel : John Wiley & Sons
4. Applied Physics by P.K.Mittal, IK International Publishing House (P) Ltd.
5. Engineering Physics by G Sahashra Buddhe; University Press

**I Year B.Tech (Common to all branches)**

| L | T/P/D | C |
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## (5BS01) ENGLISH

**Introduction**

This is the age of information and communication technologies. Engineers and technical professionals need to convey technical information in English for various purposes.

Besides learning general English as an international language, engineering students need to be equipped with adequate writing ability so that they can communicate technical information clearly on at least a basic level. A good English writing proficiency can be a contributing factor to professional recognition and career prospects. This course teaches those writing strategies that scientists, engineers, and others will need in order to write successfully on the job. It initiates the students into Technical Writing. The purposes of technical writing are to inform and persuade. This program aims to train students in writing clear, concise and effective English and also develop their reading skills.

This Syllabus is therefore, a Pragmatic English Writing and Reading Program for engineering students with intermediate proficiency. The program covers a syllabus outline and instructional approaches on basic writing and reading skills with particular reference to technical writing.

**Course Objectives:**

- To equip the students with all the LSRW skills for academic writing and speaking.
- To equip the students with basic grammar, infrastructural patterns, reading techniques and grammatical constructions required in technical writing as well as oral communication.
- To acquaint the students with the writing process in preparation for academic and workplace writing.
- Equip the students with the concept of coherence and cohesion for meaningful and coherent communication.

**Course Outcomes:**

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

- Comprehend technical writing produced in the engineering profession
- Understand the writing process and create logical paragraphs
- Use infrastructural patterns in writing and speaking
- Students communicate coherently orally and in writing.

**Methodology**

A Task-based, process oriented methodology will be used by the teachers to give a practical orientation to the teaching of language. An inductive approach will be used to demonstrate the use of language in context. This should enable the students to internalize the language structures and vocabulary used in context. Students will be exposed to numerous examples and ample practice will be given in the contextual use of language structures.

**Syllabus Outline**

**Unit I : Review of Grammar**

i) Common Errors v) Use of Articles and Prepositions
ii) Subject-Verb Agreement vi) Conjunctions
iii) Adverbs vii) pronoun reference
iv) Transitional elements

**Unit II : Prose 1**

- Heaven's Gate by Pico Iyer
- The Connoisseur by Nergis Dalal

**Unit III Reading and Writing Skills**

- Reading Comprehension -- Skimming & scanning
- Reading Comprehension -- Intensive & extensive reading
- Paragraph Writing
- Letter Writing
- Memo Writing

**Unit IV : Prose 2**

- The Cuddalore Experience by Anu George
- The Odds Against Us by Satyajit Ray

**Unit V : Writing Skills**

1. Comparison and Contrast Pattern
2. Cause and Effect Pattern
3. Classification
4. Analogy (Introductory Level)
5. Problem-Solution Pattern

**Prescribed Text Books**

- **Enjoying Everyday English** by A. Ramakrishna Rao
- **Effective Technical Communication** by Ashraf Rizvi
- **Technical Writing Process and Product** by Gerson Sharon J. and Steven Gerson 3rd edition, New Jersey: Prentice Hall 1999

**References**


- M. Raman and S. Sharma, 2004; Technical Communication : Principles and Practices, OUP, (Indian Edition)
- Blanton, L.L. 1993; Composition Practice, Book 4 ,Second Edition, Heinle & Heinle Publishers, pp. 54
- Georges, T.M. 1996; A course in Analytical Writing for Science and Technology, http://www.mspiggy.etl.noaa.gov/write/

| I Year B. Tech EEE – I Sem | L | T/P/D | C |
|---|---|---|---|
| | 3 | 1 | 4 |

**(5CS01) COMPUTER PROGRAMMING**
**(Common for EEE, ECE, CSE, EIE &IT)**

**Pre-requisites:** Basic computer Knowledge, Linear Algebra

**Course Objectives:**

- To relate basics of programming language constructs and problem solving techniques
- To classify and implement derived data types
- To analyze and develop effective modular programming
- To construct mathematical problems and real time applications using C language

**Course Outcomes:**

**After completion of the course the student is able to**

- Develop algorithm, flow chart and pseudo code for a given mathematical problems
- Write, compile and debug programs using different programming constructs in C language.
- Usage of different basic and derived data types in C.
- Design programs using modular structures

**UNIT-I**

Computer fundamentals-Hardware, software, computer language , translators, Program Development steps-Algorithms, Pseudo code, flow charts, basic Linux commands ,Introduction to C Language – History, Simple C Program, Identifiers, Basic data types, user defined data types, Variables, Constants, type qualifiers, Managing Input / Output, Operators, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Simple C Programming examples.

**UNIT- II**

Selection Statements – if and switch statements, Repetitive statements – while, for, do-while statements, C Programming examples, other statements related to looping – break, continue, go to, C Programming examples.

**UNIT- III**

Arrays– Basic concepts, one-dimensional arrays, two – dimensional arrays, multidimensional arrays, C programming examples.

Introduction to Structured Programming, Functions- basics, user defined functions, inter function communication, Standard functions, Storage classes-auto, register, static, extern, scope rules, arrays to functions, recursive functions, example C programs.

**UNIT- IV**

Strings – Basic concepts, String Input / Output functions, arrays of strings, string handling functions, strings to functions, C programming examples

Derived types – Structures – Basic concepts, nested structures, arrays of structures, structures and functions, unions, bit fields, C programming examples.

**UNIT-V**

Preprocessor Directives, Pointers – Basic concepts, pointers and functions, pointers and strings, pointers and arrays, pointers and structures, self-referential structures , example C programs.

**TEXT BOOKS:**


1. C Programming A Problem-Solving Approach by Behrouz A.Forouzan, E.V.Prasad, Richard F.Gilberg
2. How To Program: C, Dietel & Dietel, Seventh Edition, PHI


**REFERENCES:**


1. The C Programming Language by Brian W. Kernighan, Dennis M. Ritchie.
2. Absolute beginner's guide to C, Greg M. Perry, Edition 2, Publisher: Sams Pub., 1994.
3. Computer Programming and Data Structures by E Balagurusamy, Tata McGraw Hill.
4. Let Us C, Yashavant Kanetkar BPB

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| **I Year B. Tech EEE– I Sem** | **L** | **T/P/D** | **C** |
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| | **3** | **0** | **3** |

**(5CE03) ENVIRONMENTAL STUDIES**
**(Common for All Branches)**

**Course Objectives:**

- **Recognize** the importance of environment and ecosystem
- **Identify &Analyze** human activities and its impact on environment.
- **List and understand** about the importance of natural resources, Biodiversity & effect of environment pollution
- **Understand** about environmental regulations ,economy and environment interaction

**Course Outcomes**

After completion of this course the student is able to

- **Acquire** the knowledge about importance of environment & ecosystem
- **Develop** skills in understanding of various environmental problems
- **Find** the solution and strategies to protect the Environment
- **List & Distinguish** various organizations, regulations for environment protection

**UNIT-I**

**Environmental Studies:**

Introduction, Definition, scope and importance.**Ecosystems**: Introduction, types, characteristic features, structure and functions of ecosystems. Bio-geo-chemical cycle, Classification of Ecosystem.

**Bio-diversity and its conservation-** Value of bio-diversity, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity – In-situ and Ex-situ conservation.

**UNIT-II**

**Natural Resources**: classification of Resources, Land resources, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems, Forest resources, Use and over-exploitation, food resources, food miles.

**Mining and dams** – benefits & effects, Water resources, Use and over - utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Conflicts over Water, Energy resources.

**UNIT-III**

**Environmental pollution and its control**: Classification of pollution and pollutants, Air pollution, Causes, Effects, Control measures, ambient air quality standards, water pollution causes, effects, control measures, water quality standards, Marine pollution causes, effects

& control measures, noise pollution causes, effects and control measures, land pollution causes, effects and control measures, solid waste management, e-waste management.

**UNIT-IV**

**Global environmental problems and global efforts:** Nuclear hazards, Nuclear Pollution, Global warming, Acid rains, ozone layer depletion, over population, hazardous waste. Clean development mechanism, green building, carbon credits, carbon trading.

**International Conventions/protocols:** UNEP, UNFCC, Earth summit, Kyoto protocol, Montreal protocol and Stockholm declaration.

**UNIT-V**

**Environmental policy, legislation, rules and regulations :** National Environmental Policy Environmental Protection act, Legal aspects Air (Prevention anc Control of pollution ) Act-1981, Water( Prevention and Control of pollution ) Act-1974, Water pollution Cess Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .

**Economy and Environment**, The economy and environment interaction, Economics of development, preservation and Conservation, Sustainability: theory and practices.

Environmental Impact Assessment, Rain water harvesting, cloud seeding and watershed management.

**TEXT BOOKS:**

1. Environmental Science by Y.Anjaneyulu, B S Publications, 2004.
2. Environmental studies by Deeksha dave, Cengage learning India Pvt. Ltd, 1st edition, 2011.
3. Environmental Science and Technology by M. Anji Reddy, B S Publications, 2010.

**REFERENCES:**

1. Environmental Studies for UG Courses, Bharucha Erach, UGC Publications, Delhi, 2004.
2. Environmental Encyclopedia by Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.
3. Environmental sciences and Engineering by P.Venugopal Rao, PHI Learning Pvt. Ltd.,

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**I Year B. Tech EEE – I Sem** **L T/P/D C**

**2 4 4**

## (5ME19) ENGINEERING DRAWING

## (Common for EEE, ECE, CSE ,EIE & IT)

**Course Prerequisites:** Geometrical construction

**Course Objectives:**

- Understand the Usage of Drawing Instruments & Auto Cad Commands.
- Understand the Construction Method for Drawing Engineering Curves.
- Understand the Concept of Principal of Projections of Lines, Planes and Solids.
- Understand the Conversion of Isometric to Orthographic Projections and Vice-Versa.

**Learning Outcomes:**

Students will be able to

- Apply Auto Cad Commands to Construct Engineering Curves.
- Draw the Projections of Lines, Planes and Solids with different Positions.
- Construct different positions of Lines, Planes and Solids in Auto Cad Software.
- Visualize the Objects in the Conversion Process of Isometric Projections to Orthographic projections and Vice-Versa.

**UNIT – I**

Introduction to Engineering Drawing; Introduction to AutoCAD; Construction of Ellipse, Parabola and Hyperbola – General and Special methods; Cycloidal curves.

**UNIT – II**

Projections of points; Projections of lines and planes – inclined to one plane and inclined to both the planes.

**UNIT – III**

Projections of solids: Prism, Pyramid, Cylinder, Cone - axis inclined to one plane and inclined to both the planes.

**UNIT – IV**

Isometric projections of lines, planes and simple solids.

**UNIT – V**

Conversion of orthographic views into isometric views and vice-versa.

**TEXT BOOKS:**


1. Engineering Drawing By N.D.Bhatt.
2 Engineering Graphics By K.L. Narayana & P.Kannayya.


**REFERENCES:**


1. Engineering Drawing and Graphics: Venugopal/ New age
2. Engineering Drawing: Johle / TMH

| I Year B. Tech (Common to all branches) | L | T/P/D | C |
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| | 0 | 3 | 2 |

## (5BS02) ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

The English Language Communication Skills Lab aims to provide practice in all the four skills of LSRW, with a special emphasis on listening and speaking skills.

**Course Objectives:**

- Provide ample practice in LSRW skills and train the students in oral presentations, public speaking, role play and situational dialogue.
- Provide practice in word usage, grammatical construction, structural patterns, and improve comprehension abilities in the students.
- Train students to use neutral pronunciation through phonetic sounds, symbols, stress and intonation.
- Enable students to transfer information from verbal to graphic representation and vice versa.

**Course Outcomes:**

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

- Comprehend spoken and written discourse.
- Speak fluently with neutral pronunciation and exhibit interpersonal skills.
- Write accurately, coherently and lucidly making appropriate use of words depending on context and present data clearly.
- Introduce oneself to people and be able to speak extempore.

**UNIT I**

**Computer Aided Language Lab:**

- Grammar : Nouns and Pronouns; Articles; The Present Tense
- Vocabulary: Lesson 1
- Listening Comprehension

**Communication Skills Lab:** Introduction of Self and others

**UNIT II**

**Computer Aided Language Lab:**

1. Grammar: Concord; Adjectives; The Past Tense
2. Vocabulary: Lesson 2
3. Listening Skills

**Communication Skills Lab:** Seeking and Giving Information, Giving and Taking Instructions

**UNIT III**

**Computer Aided Language Lab:**

Grammar --- Adverbs, Conjunctions, Prepositions; The Future Tense

- Vocabulary: Lesson 3
- Telephoning Skills

**Communication Skills Lab:** Role Play/ Situational Dialogues

**UNIT IV**

**Computer Aided Language Lab:**

1. Grammar ---- Active and Passive Voice
2. Vocabulary: Lesson 4
3. Listening Comprehension

**Communication Skills Lab: i) JAM**/ Short Talk ii) Information Transfer a) Interpretation of Graph

**UNIT V**

**Computer Aided Language Lab:**

**1. Introduction to Technical Writing**

A. Definition of a Technical Term
B. Description of a Mechanism
C. Description of a Technical Process

**2**. Vocabulary: Lesson 5

**Communication Skills Lab :** Presentation Skills: Oral Presentation

**Computer Aided Language Lab Requirements:**

**The English Language Lab shall have two parts:**

i) **The Computer aided Language Lab** for 30 students with 30 systems, one master console, LAN facility and English language software for self- study by learners.

ii) **The Communication Skills Lab** with conference tables and movable chairs for 30 students and audio-visual aids with a P.A System, a T. V., a digital stereo – audio & video system and a camcorder

- **System Requirement (Hardware component):**
  Computer network with Lan with 30 multimedia systems with the following specifications:
  - P – IV Processor
  - Speed – 2.8 GHZ
  - RAM – 512 MB Minimum
  - Hard Disk – 80 GB
  - Headphones of High quality

**iv) Suggested Resources:**

Software consisting of the prescribed topics elaborated above may be procured and used. Additionally, the abundantly available online resources may also be used.

**List of suggested software:**

- **Tense Busters (5 Levels)**
- **Walden Educare**
- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

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## (5CS51)COMPUTER PROGRAMMING LABORATORY

## (Common for EEE, ECE, CSE ,EIE & IT)

**Pre-requisites:** Basic computer Knowledge

**Course objectives**

- Gain a working knowledge of C programming to write modular, efficient and readable C programs by Identifying the structural elements and layout of C source code.
- Declare and manipulate single and multi-dimensional arrays of the C data types and derived data types like structures, unions.
- Use functions from the portable C library and to describe the techniques for creating program modules using functions and recursive functions.
- Manipulate character strings in C programs. Utilize pointers to efficiently solve problems

**Course Outcomes:**

After completion of this course the student is able to

Upon completion of the course, the students are expected to

- Apply and practice logical ability to solve the problems using C
- Understand C programming development environment.
- Analyzing the complexity of problems , modularize the problems into small modules and convert them into programs
- Document and present the algorithms flow charts and programs .

**Week 1**

a. Basic Linux commands

b. Simple C programs -to implement basic arithmetic operations – sum, average, product, smallest, largest of the numbers, difference, quotient and remainder of given numbers etc.

**Week 2**

Programs on if, else-if, nested if, else if ladder - largest and smallest of given numbers, to find the grade of a student based on marks, roots of a quadratic equation etc.

**Week 3**

a. Programs on switch-case – to check the type of a given character, to find the grade of a student etc.

b. Programs on while and do-while- to find factorial, Fibonacci series, GCD, sin(x), cos(x) series , to check whether a given number is an Armstrong, Palindrome, Perfect, number conversion, and Prime number etc.

**Week 4**

Programs on for loop- sum of n natural numbers, factorial, sin(x), to generate Pascal's triangle etc.

**Week 5**

a. Programs on nested loops – check for Fibonacci prime, Pyramids of numbers, generation of prime numbers in the given range, multiplication table etc.

b. programs using break, go to, continue.

**Week 6**

a. Programs on 1-D array-finding Minimum and maximum element ,Sorting and Searching etc.

b. Programs on 2-D array – Sum, product and Multiplication of two Matrices etc.

**Week 7**

a. Programs on Functions-Implementation of user defined functions categories, passing of arrays to functions etc.

b. Programs on recursion - factorial of a given integer, GCD of two given integers etc.

**Week 8**

a. Programs on String handling functions-Copying, reverse, substring, concatenation.

b. Programs on structure and unions.

**Week 9**

Midterm exam

**Week 10**

Programs using pointers- pointer basic operations

**Week 11**

Programs on pointers towards structures,

**Week 12**

Programs on pointers to arrays

**Week 13**

Programs on pointers to strings

**Week 14**

Programs on pointers to functions

**Week 15**

Programs on preprocessor directives

**Week 16**

Internal Lab Exam

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| **I Year B.Tech (Common to EEE, ECE, EIE, CSE, IT,CE)** | **L** | **T/P/D** | **C** |
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## (5ME53) IT AND ENGINEERING WORKSHOP

**Course Prerequisites:** basic knowledge about different Trades, computer hardware, Operating System, different trades in mechanical engineering.

**Course Objectives**:

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

- To study/demonstrate the concepts of computer w.r.t. it's hardware.
- To install the operating system and perform various tasks
- To conduct the experiments related to production engineering technology.
- To demonstrate the usage of power tools, CNC lathe and machine shop for different exercises

**Course Outcomes**:

Students will be able to

- Identify, assemble and dissemble the given configuration of a computer.
- Install the operating system in the given configuration of a computer and execute commands for LINUX Operating System
- To develop components using the techniques of carpentry, tin smithy, forging, etc. listed in trades for exercises.
- To work out the given models in machine shop and CNC lathe.

**IT WORKSHOP**

1. Computer Hardware: Identification of Peripherals
2. Study of UPS and SMPS
3. Assembling and disassembling of a PC
4. Simple diagnostic exercises – Related to hardware
5. Installation of Windows Operating System
6. Installation of Linux Operating System
7. Linux Basic Commands
8. Simple diagnostic exercises –Related to Operating System

**TEXTBOOKS:**

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by Davis Anfinson and Ken Quamme CISC Press, Pearson Education.
2. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)

**ENGINEERING WORKSHOPTRADES FOR EXCERCISES**

At least **two** exercises from each trade:

1. Carpentry
2. Tin-Smithy
3. Fitting
4. Welding
5. Electrical Wiring

**TRADES FOR DEMONSTRATION and EXPOSURE:**

1. Power tools in construction, wood working, electrical engineering and mechanical engineering.

2. Machine shop.
3. CNC Lathe.
4. 3D Printing.

**TEXT BOOKS:**

1. Workshop Manual by P.Kannaiah and K.L.Narayana; Publisher: Scitech.

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**(5BS12) Ordinary Differential Equations and Laplace Transforms**
**(Common for all branches)**

**Course prerequisites**: Differentiation and Integration

**Course Objectives**:

- Understand the methods of solving first order differential equations and learn about its applications to basic engineering problems.
- Understand the methods of solving higher order differential equations and learn about its applications to basic engineering problems.
- Understand the method of series solutions of second order ordinary differential equations.
- Apply the convolution theorem to evaluate Laplace Transform of the functions.

**Learning Outcomes**:

Students will be able to

- Solve the problems in first order differential equations.
- Solve the problems in second order differential equations.
- Obtain the series solutions of second order ordinary differential equations.
- Learn Laplace Transform as a tool.

**UNIT I**

**Ordinary Differential Equations of First Order and Their Applications:**

Differential equations of first order and first degree - Exact differential equation , Linear and Bernoulli differential equation , Applications of differential equations of first order and first degree - Newton's law of cooling, Law of natural growth and decay, Orthogonal trajectories and basic circuits(L-R Circuits, R-C Circuits).

**UNIT II**

**Differential Equations of Higher Order and Their Applications:**

Differential equations of higher order - homogeneous and non-homogenous type, differential equations of second order and higher order with constant coefficients with right hand side term of the type $e^{ax}$ sin (ax), cos (ax), polynomials in x, $e^{ax}$ V(x), x V(x) and method of variation of parameters, applications to spring mass system ,Simple harmonic motion and L-C-R Circuits.

**UNIT III**

**Differential Equations with Variable Coefficients:**

Euler-Cauchy's 2nd order differential equations, Series solutions of second order Ordinary Differential Equations, Regular point, Regular singular point, Frobineous Method.

**UNIT IV**

**Laplace Transforms:**

Existence condition, Laplace transform of Elementary functions, Properties of Laplace transforms, Laplace transform of special functions (Unit step function, Dirac delta function and Periodic function).

**UNIT V**

**Inverse Laplace Transforms:**

Inverse Laplace transform of functions using partial fractions, Convolution theorem (statement only). Solving linear differential equations and Integro-differential eqations using Laplace transform.

**TEXT BOOKS:**

1. Higher Engineering Mathematics – B. S. Grewal,Khanna publishers.
2. Advanced Engineering Mathematics *by R.K.Jain and S.R.K.Iyengar; Narosa Publications.*

**REFERENCES:**


1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition; Publisher: John Wiley.
2. Advanced Engineering Mathematics by Peter V. O'Neil, 9th Edition; Publisher: Cengage Learning
3. A First Course in Differential Equations by Dennis G. Zill; Publisher: Brooks Cole publiers.

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**(5BS13)Computational Methods**

(Common for all Branches)

**Course prerequisites:**Elementary transformations of matrices, differentiation and integration.

**Course objectives:**

- Understand the numerical methods for non linear systems, evaluating definite integrals and solving Ordinary Differential Equations.
- Understand various methods of interpolation and application.
- Understand the Echolen form and Normal form of a matrix and its applications in solving linear system of equations.
- Solving system of linear equations using Jacobi and Gauss-Seidal methods.

**Learning outcomes**:

Student will be able to

- Apply the numerical methods to find a root of algebraic and transcendental equations.
- Apply the numerical methods to find the solutions of ordinary differential equations.
- Find the rank using Echelon form, Normal form and compute eigen values.
- Solve linear equations using Jacobi method and Gauss-Seidal method

**UNIT I**

**Solutions of non-linear systems:**

Introduction; Mathematical preliminaries; Solution of algebraic and transcendental equations –bisection method, the method of false position, Fixed point iterative method , Newton - Raphson method, and their order of convergence.

**UNIT II**

**Interpolation:**

Introduction; Errors in polynomial interpolation; Finite differences; Forward differences; Backward differences; Central differences; Symbolic relations and separation of symbols; Differences of a polynomial; Newton's formulae for interpolation; Central difference interpolation formulae; Gauss's central difference formulae and Lagrange's interpolation formulae.

**UNIT III**

**Numerical differentiation and Integration:**

Numerical differentiation based on interpolation, Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule, Gaussian quadrature 2 & 3 point formulae.

**Numerical solutions of ordinary differential equations:**

Solution of initial value problems by Taylor's series - Picard's method of successive approximations, Euler's method, and Runge - Kutta methods.

**UNIT IV**

**Matrices:**

Elementary Transformations, Rank of matrix, Echelon and Normal forms, Consistency of linear simultaneous equations, Eigen values and eigen vectors and their properties, Caley – Hamilton theorem (without proof),Quadratic forms - reduction of quadratic form to canonical form by linear(congruent) and orthogonal transformations.

**UNIT V**

**Complex Matrices and Iterative Methods for Real Systems:**

Unitary, Hermitian and skew – Hermitian matrices.Iterative methods for solving a system of linear equations(Jacobi method, Gauss-Seidalalgorithm) and Power method to find largest and smallest eigen values.

**TEXT BOOKS**

1.Numerical Methods in Engineering and Science–B.S. Grewal, 3rdedition Publisher: Khanna
Publishers

2. Advanced Engineering Mathematics by R.K.Jain and S.R.K.Iyengar; Narosa Publications.

**REFERENCES**

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition; Publisher: John Wiley and Sons.

2. Elementary Numerical Analysis – an algorithmic approach -Samuel D. Conte and Carl De Boor (2006); 3rd edition; Publisher: Tata McGraw Hill

(Beyond Syllabus: Types of errorsand analysis)

**I Year B.Tech EEE– II Sem**

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## (5EE01) CIRCUIT THEORY
## (Common for EEE, ECE & EIE)

**Course Pre requisites:** Basic Mathematics and Advanced Calculus

**Course Objectives**

- To understand the basic concepts of Circuit Analysis.
- To analyze single phase ac circuits and magnetic circuits.
- To apply Network Theorems for Circuit Analysis.
- To understand the graph theory for circuit analysis

**Course Outcomes**

After the completion of the course students is able to

- Apply basic network reduction techniques for analysis of electrical circuits.
- Analyze ac circuits along with resonance and locus diagrams.
- Appreciate the application of network theorems
- Analyze graph theory and apply topology solutions.

**UNIT–I**

**INTRODUCTION TO ELECTRICAL CIRCUITS**

Circuit Concept – R-L-C parameters – Voltage and Current sources – Independent and dependent sources-Source transformation – Voltage – Current relationship for passive elements (for different input signals-square, ramp, saw tooth, triangular). Kirchhoff's laws – network reduction techniques – series, parallel, series parallel, star-to-delta or delta-to-star transformation. Nodal analysis, Mesh analysis, Super Node and Super Mesh analysis of Networks with Independent and Dependent voltage and current sources.

**UNIT–II**

**MAGNETIC CIRCUITS**

Magnetic Circuits – Faraday's laws of electromagnetic induction – concept of self and mutual inductance – dot convention – coefficient of coupling – composite magnetic circuit - Analysis of series and parallel magnetic circuits

**UNIT–III**

**SINGLE PHASE A.C CIRCUITS**

R.M.S and Average values and form factor for different periodic wave forms, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation – Concept of Reactance, Impedance, Susceptance and Admittance – Phase and Phase difference – concept of power factor, Real and Reactive powers – J-notation, Complex and Polar forms of representation, Complex power.

**UNIT-IV**

**LOCUS DIAGRAMS AND RESONANCE**

Locus diagrams – series R-L, R-C, R-L-C and parallel combination with variation of various parameters – Resonance – series, parallel circuits, concept of band width and Q factor.

UNIT–V

**NETWORK TOPOLOGY AND NETWORK THEOREMS :**

Definitions – Graph – Tree, Basic cutset and Basic Tieset matrices for planar networks - Duality and Dual networks. Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Tellegen's, Millman's and Compensation theorems for d.c. and a.c. excitations.

**TEXT BOOKS:**


1. Engineering circuit analysis by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th Edition.
2. Circuit Theory by A. Chakrabarti, Dhanipat Rai and Co., 6th Edition.
3. Fundementals of electric circuits by Charles k Alexander, Mathew N O Sadiku, Tata Mc Graw Hill Company, 3rd Edition


**REFERENCES:**


1. Network Analysis by M. E Van valkenburg, PHI.
2. Linear circuit analysis (time domain phasor, and Laplace transform approaches) by RAYMOND A.DECARLO and PEN-MIN-LIN, Oxford University Press. 2nd Edition, 2004.
3. Network Theory by N.C. Jagan and C.Lakshminarayana, B.S Publications.
4. Electrical Circuit theory by K. Rajeswaran, Pearson Education 2004.
5. Basic Circuit analysis by D.R, Cunningham and J.A Stuller, Jaico Publications
6. Network Analysis by A. Sudhakar, Shyammohan Palli, Mc Graw Hill Company,

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**(5BS23) ADVANCED ENGINEERING PHYSICS**

(Common for ECE, EEE & EIE Branches)

**Course Objectives**

- To learn basic structures and classifications of solids.
- To study nature of dielectric, magnetic and conducting properties of materials.
- To visualize different kinds of materials in engineering and technology.

**Course Outcomes:**

After completion of the course the student is able to

- Identify different types of crystals, their defects and importance of X-ray studies in crystals.
- recognize materials' magnetic, dielectric and conducting behavior.
- show case some applications of crystals and different kinds of materials in engineering.

**UNIT I**

**SEMICONDUCTOR PHYSICS**:

Fermi level in Intrinsic and Extrinsic semiconductors, Intrinsic semiconductor and carrier concentration, Extrinsic semiconductor and carrier concentration, Equation of continuity, Direct and indirect band gap semiconductors, Hall Effect, Formation of p-n junction, Open circuit p-n junction, Energy diagram of diode, I/V characteristics of p-n junction diode, Diode equation.

**UNIT II**

**CRYSTAL STRUCTURES**:

Space lattice, Unit cell, Lattice parameter, Crystal systems, Bravais lattice, Atomic radius, Co-ordination number, Structures and Packing fractions of Simple Cubic, Body Centered Cubic, Face Centered Cubic, Hexagonal closed packed & diamond Cubic Crystals.

**UNIT III**

**DIRECTIONS, PLANES AND X-RD:**

Miller Indices for Crystal planes and directions, Inter planar spacing of orthogonal crystal systems, Diffraction of X-rays by crystal planes and Bragg's law, Bragg's Diffractometer, Applications of X-ray diffraction.

**DEFECTS IN SOLIDS**:

Imperfections in crystals, Point defects (Vacancies, Interstitial and Impurities), Schottky and Frenkel defects (with mathematical treatment), Line imperfections, Edge and Screw dislocation, Burger vector, Surface defects and volume defects (Qualitative Treatment).

**UNIT IV**

**MAGNETIC PROPERTIES OF MATERIALS**:

Permeability, Field intensity, magnetic field induction, Magnetization and Magnetic susceptibility, Origin of magnetic moment, Bohr magneton, Classification of magnetic materials (Dia, Para and Ferro), Domain theory of ferromagnetism - Necessity, Formation, Hysteresis curve, Soft and Hard magnetic materials, Ferrites and their applications.

**UNIT V**

**DIELECTRIC PROPERTIES**:

Electric dipole, Dipole moment, Dielectric constant, Electronic, Ionic and Orientation Polarization – Molor Polarization and Experimental determination of Molor Polarization, Calculation of Polarizibilities, Internal fields – Claussius – Mossotti equation, Piezo and Ferro electricity

**SUPERCONDUCTORS:**

Experimental survey and superconductivity phenomenon, Meissner effect, Critical fields and Persistent currents, Type I and Type II superconductors, London equations, Flux quantization, BCS Theory, Applications of Superconductors.

**TEXT BOOKS:**


1. Introduction to Solid State Physics by Charles Kittel , Publishers: John Wiley & Sons
2. Applied Physics by P.K.Mittal, IK International Publishing House (P) Ltd


**REFERENCES:**


1. Solid State Physics by A.J.Dekker; Macmillan Publishers India Ltd.
2. Engineering Physics by G Sahashra Buddhe; University Press
3. Elements of Solid State Physics by J.P.Srivatsva, PHI Publishers
4. Engineering Physics by M.R.Srinivasan, New Age Publishers
5. Solid State Physics by M.A. Wahab.

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## (5BS32) ENGINEERING CHEMISTRY

(Common for all branches)

**Pre-requisites:** Basic knowledge of mathematics and chemistry.

**Course Learning Objectives**

- Understanding the concept of generating electricity by batteries.
- Conceptual knowledge of corrosion science.
- Acquiring the knowledge of preparation, properties and usage of polymers.
- Applying the concept of hardness to analyze various boiler troubles in steam generation.
- Familiarize the features of carbon nanotubes, composites and self- healing materials.

**Course Outcomes**

**After the completion of the course student will be able to,**

- Interpret the chemical applications of the various types of batteries used in the present day world.
- Acquire the knowledge of corrosion for protecting structures and safeguarding the economy.
- Evaluate the suitability of various polymers for different applications.
- Analyze and compare the different softening techniques of water.
- Summarize the applications of carbon nanotubes, composites and self- healing materials.

**UNIT I**

**Batteries and Fuel cells (10 periods)**

Electrochemistry-definition, types of cells- differences between electrolytic and electrochemical cells, conditions of reversibility, principle of batteries, Primary cells-(Dry cell, Mercury battery) and secondary cells -lead-acid cell; Ni-Cd cell; lithium- ion cells (intercalated); Fuel cells : methanol – oxygen fuel cell, advantages of fuel cells; Solar cells - principle and applications.

**UNIT II**

**Corrosion and its control(12 periods)**

Introduction; Causes and effects of corrosion; Theories of corrosion – chemical and electrochemical corrosion (reactions); Types of corrosion ( Differential aeration corrosion: pitting, crevice and waterline corrosion, Differential metal corrosion: galvanic corrosion) ; Factors affecting corrosion – nature of metal (position of metal in galvanic series-differences between electrochemical & galvanic series; passivity; purity of metal; nature of oxide film; nature of corrosion product), and nature of environment (effect of temperature; effect of pH; humidity; formation of oxygen concentration cells).

Corrosion control methods – cathodic protection-sacrificial anode and impressed current cathodic protection.

Surface coatings –differences between galvanizing and tinning; cladding; electroplating (copper plating),Paints - constituents and functions.

**UNIT III**

**Polymers (8 periods)**

**Plastics** - Thermoplastic resins, and Thermosetting resins, fabrication of plastics – compression, injection. Preparation, properties, and engineering applications of PE, PVC, Teflon, Bakelite, Nylon and Kevlar.

**Rubber**

Processing and vulcanization, preparation, properties, and engineering applications of Buna-S; Butyl rubber and Thiokol rubber**.**

**UNIT IV**

**Water and its Treatment (10 periods)**

Introduction; Hardness - causes, expression of hardness, units, types of hardness, numerical problems. Estimation of temporary & permanent hardness of water by EDTA method (no numerical problems).Boiler troubles - scale & sludge formation, caustic embrittlement, boiler corrosion, priming & foaming. Softening of water by zeolite and ion exchange process (no numerical problems), Desalination processes. reverse osmosis.

**UNIT V**

**Smart materials (8 periods)**

**Nanomaterials** -Introduction; preparation and applications of nanomaterials with special reference to carbon nanotubes.

**Composites-**Need for composites, classification based on reinforcing material (Fiber reinforced composites –glass, carbon and aramid), applications of composites.

**Self-healing materials-** Definition, features, principle of self-healing materials and their applications.

**TEXT BOOKS**


1. Text Book of Engineering Chemistry by Y.Bharathi Kumari, Jyotsna Cherukuri; Publisher: VGS Book Links.
2. Engineering Chemistry by P.C.Jain & Monica Jain, Publisher: Dhanpatrai Publishing Company.


**REFERENCES**


1. Text Book of Engineering Chemistry by S.S. Dhara & Mukkanti; Publisher: S.Chand & Co.
2. Engineering Chemistry by O G Palanna; McGraw Hill Edu.Pvt.Ltd.
3. Text Book of Engineering Chemistry by R.Gopalan, D.Venkappayya, SulochanaNagarajan; Publisher: Vikas Publishers.
4. Engineering Chemistry by R.P.Mani, S.N. Mishra, B.Rama Devi, Cengage Learning Publications.

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| **I Year B. Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**(5IT02)DATA STRUCTURES**

**(Common for EEE, ECE, CSE, EIE & IT)**

**Prerequisites:** 'C' Programming language

**Course Objectives:**

- To **summarize** efficient storage mechanisms of data for an easy access.
- **Implementation** of various basic and advanced data structures.
- To **introduce** various techniques for representation of the data in the real world.
- To **develop** application using data structures.

**Course Outcomes:**

**After completion of the course the student is able to**

- **Explore** and **analyze** the working of linear data structures like list, stack and variations of queue in both static and dynamic implementation.
- Relate and **demonstrate** the application of linear data structures.
- **Illustrate** and implement basic non linear data structures like trees, graphs and their operations.
- **Identify** and implement basic and advanced comparison based sorting and searching techniques.

**UNIT-I**

File Management:

File I/O – Basic concepts, text files and binary files, file input / output operations, file status functions (error handling), C programming examples, command-line arguments.

Data Structures – Introduction to data structures, abstract data types, dynamic memory allocation.

**UNIT –II**

Linear list – Singly linked list implementation, insertion, deletion and searching operations on linear list, circular linked list implementation, double linked list implementation, insertion, deletion and searching operations. Applications of linked lists.

**UNIT-III**

Stacks-Operations, array and linked representations of stacks, stack applications-infix to postfix conversion, postfix expression evaluation, recursion implementation.

Queues-operations, array and linked representations. circular queue operations, dequeues, applications of queue.

**UNIT-IV**

Trees – Definitions, binary tree representation, binary search tree, binary tree traversals.

Graphs – Definitions, graph representations, graph traversals.

**UNIT-V**

Searching and Sorting – Big O Notation, Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort,
Searching-linear and binary search methods.

**TEXT BOOKS:**

1. C Programming& Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Data Structures Using C (Paperback) by Aaron M. Tenenbaum

**REFERENCES:**

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education
3. C Programming & Data Structures, E. Balagurusamy, TMH.
4. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
5. C& Data structures – E V Prasad and N B Venkateswarlu, S. Chand&Co.

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## (5BS25) ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LABORATORY

## ENGINEERING PHYSICS LAB LABORATORY

**Course Objectives:**

- To practically learn interaction of light with matter through physical phenomena like interference, diffraction and dispersion.
- To understand the periodic motion and formation of standing waves and to know the characteristics of the capacitors and resistors.
- To compare the experimental results with the class room learning.

**Course Outcomes:**

After completion of the course the student is able to:

- Demonstrate the optical phenomena with formation of Newton Rings, and formation of spectra with a grating and a prism.
- Illustrate periodic motion by measuring rigidity modulus of a material and formation of standing waves by Melde's apparatus and also discharging of a capacitor.
- Correlate the experimental results with the class room learning.

**Any Eight Experiments from the following:**

1. Dispersive Power of the material of a Prism using Spectrometer
2. Diffraction Grating (both with Laser and non laser source)
3. Single Slit with laser light
4. Newton Rings
5. Finding thickness of a thin wire or sheet by forming a wedge shaped film
6. Energy gap of a semiconductor material
7. To determine the rigidity modulus of material of a wire
8. Melde's experiment
9. Sonometer Experiment
10. AC frequency by sonometer method
11. Numerical Aperture and Acceptance angle of an optical fiber cable
12. Attenuation and Bending losses in optical fiber
13. Stewart Gee's experiment
14. Characteristics of LED/Laser Diode.
15. Photo cell/ Solar Cell
16. C circuit

**REFERENCES:**

1. Essential Practical Lab Manual in Physics: by Dr.P.Raghavendra Rao,P.Pavankumar and B.Ashok (inhouse document)
2. Engineering Physics Practicals by B.Srinivasa Rao, V.K.V.Krishna and K.S.Rudramamba, University Science Press, New Delhi

## ENGINEERING CHEMISTRY LABORATORY

**Pre-requisites:** Basic knowledge of Volumetric Analysis and Mathematics.

**Course Objectives:**

- Familiarize the preparation of solutions and operation of instruments
- Conduct of experiment, collection and analyzing the data
- Summarizing the data and find the applicability of the experiment to common society

**Course Outcomes:**

- Understanding the preparation of standard solutions and handling of instruments
- Knowledge of experimentation and recording the data
- Interpretation of results to real world scenario

**LIST OF EXPERIMENTS**

1. **Titrimetry:** Estimation of hardness of water by EDTA method.
2. **Conductometry:** Conductometric titration of acid vs base.
3. **Colorimetry:** Estimation of copper by colorimetric method.
4. **pH metry:** Determination of pH of sample solutions.
5. Determination of viscosity of sample oil by Redwood Viscometer.
6. **Preparations:** Soap and Nanoparticles.

**TEXT BOOKS:**


1. Laboratory Manual on Engineering Chemistry by S.K.Bhasin and Sudha Rani; Publisher: Dhanpat Rai.
2. Laboratory Manual on Engineering Chemistry by Y.Bharathi Kumari and Jyotsna Cherukuri; Publisher: VGS Book Links.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **I Year B. Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**(5IT52)DATA STRUCTURES LABORATORY**
**(Common for EEE, ECE, CSE, EIE & IT)**

**Course Prerequisites:** Data structures, Computer Programming
**Course Objectives:**

- To **understand** storage mechanism and implement related programs
- To **develop** skills to design and analyze simple linear and nonlinear data structures
- To **strengthen** the ability to identify and apply the suitable data structure for the given real world problem
- To gain **knowledge** in practical applications of data structures

**Course Outcomes:**

**After completion of the course the student is able to**

- **Implement** storage mechanism and to implement related programs
- **Design** and **analyze** the time and space efficiency of the data structure
- **Identity** the appropriate data structure for given problem
- Gain practical **knowledge** on the application of data structures

**WEEK 1:** 1. Programs on files-Implementation of file handling functions, file error handling.
**WEEK 2:** 2. Programs on command line arguments.

3. Programs on dynamic memory allocation.
4. Write a program to perform creates, insert, delete and search operations in Single Linked List.

**WEEK 3:** 5. Write a program to perform create, insert , delete and search operations in Circular Linked List

**WEEK 4:** 6. Write a program to perform create, insert and deletion operations in Double Linked List

**WEEK 5:** 7. Write a program to implement stack using Arrays
8. Write a program to implement stack using Linked List

**WEEK 6:** 9. Write a program to convert infix expression to postfix expression using stack
10. Write a program to evaluate postfix expression

**WEEK 7:**
11. Programs using recursion
12. Write a program to convert infix expression to prefix expression using stack

**WEEK 8:**
13. Write a program to implement Linear queue using Array
14. Write a program to implement Linear queue using Linked List

**WEEK 9:**
15. Write a program to implement insertions and deletions in a Circular Queue.
16. Write a program to implement insertions and deletions in a Dequeue.

**WEEK10: Midterm Exam**

**WEEK11:**
17. Write a program to implement Linear search, Binary search
18. Write a program to implement Bubble sort, Selection sort

**WEEK12:**
19. Write a program to implement Insertion sort
20. Write a program to implement Merge sort

**WEEK13:**
21. Write a program to implement Quick sort.

**WEEK14:**
22. Implementation of a binary tree representation using Arrays
23. Write a program to implement tree traversals.

**WEEK15:**
24. Implementation of a Graph representation using Adjacency Matrix
25. Write a program to implement graph traversals.

**WEEK16: Final Internal Lab Exam**

**TEXT BOOKS:**


1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Data Structures Using C (Paperback) by Aaron M. Tenenbaum


**REFERENCES:**


1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
3. C Programming & Data Structures, E. Balagurusamy, TMH.
4. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
5. C& Data structures – E V Prasad and N B Venkateswarlu, S. Chand&Co.

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| **II Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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**(5BS14)PDE with Applications & Complex Analysis**

**(Common for EEE, ME&AME)**

**Course prerequisites:** Differentiation, integration

**Course Objectives:**

- Compute Fourier coefficients.
- Understand the properties of Fourier transforms.
- Apply Method of Separation of Variables to solve Partial Differential Equations.
- Apply Cauchy theorem, Cauchy's Integral formula and Residue theorem to evaluate complex integration.

**Learning Outcomes:**

Students will be able to:

- Solve problems using Fourier series.
- Evaluate problems involving Fourier and Inverse Fourier transforms.
- Solve the second order linear partial differential equations by Method of Separation of Variables and Fourier series.
- Evaluate line and Contour integrals.

**UNITI**

**Standard Partial Differential Equations:**

Introduction to partial differential equations,Method of seperation of variables, Applications: Problems of vibrating string- wave equation, Problems of one-dimensional heat equation, Problems of steady state two dimensional heat flow-Laplace equation.

**UNIT II**

**Fourier Series:**

Fourier Series of periodic functions, Euler's formulae, Fourier series of even and odd functions, having arbitrary periods, half range Fourier series.

**UNIT III**

Fourier Transforms: Fourier transform, Sine and Cosine transforms and their properties.

**UNITIV**

**Functions of a Complex variable:**

Functions of a complex variable, Continuity, Differentiability, Analyticity, Cauchy-Riemann equations in Cartesian and polar coordinates, Harmonic and conjugate harmonic functions, Milne – Thompson method.

**UNIT V**

**Integration of Complex function, Power series and Residues:**

Line integral, evaluation along a path and by indefinite integration.Cauchy's Integral theorem, Cauchy's Integral formula.Expansion of Taylor's series and Laurent series (without proofs). Singular point, Isolated singular point, pole of order m , essential singularity. Residues – Evaluation of residue by formulae, Residue theorem, Evaluation of real integrals.

**TEXT BOOKS:**

1. Higher Engineering Mathematics – B. S. Grewal,Khanna publishers.
2. Complex Variables & Its Applications- Churchill and Brown, (1996), International Edition, McGraw Hill.

**REFERENCES:**

1. Advance Engineering Mathematics - Peter O'Neil,(2000),5th Edition, Cengage Learning
2. Schaum's Outline Of Complex Variables - Murray.R.Spiegel,(2011), 2nd Edition, Tata McGraw Hill.

**VNR Vignana Jyothi Institute of Engineering and Technology**

**II Year B.Tech EEE – I Sem**

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**(5EC01) ELECTRONIC DEVICES AND CIRCUITS**

**(Common for EEE, ECE & EIE)**

**Prerequisites:** Semiconductor Physics

**Course Objectives**

- To learn principle of operation, construction and characteristics of various electronic devices.
- To study operation and characteristics of Rectifiers with filters.
- To understand the analysis of small signal low frequency amplifiers.
- To provide the concepts involved in design of electronic Circuits.

**Course Outcomes**

After completion of this course the student is able to

- Understand the operation and characteristics of various electronic devices.
- Develop few applications using electronic devices.
- Analyze small signal model for BJT and FETamplifiers.

**UNIT I**

**P-N JUNCTION DIODE AND APPLICATIONS**

Review of Semi Conductor Materials, Theory of p-n Junction, p-n Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of V-I characteristic, Ideal and Practical Diode Equivalent Circuits, Static and Dynamic Resistance levels , Transition and Diffusion Capacitances.

The p-n diode as a rectifier, Half wave Rectifier, Full wave rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor filters, Capacitor filters, L- Section Filters, $\Pi$- section filters, Comparison of Regulation Characteristics of different Filters, Breakdown Mechanisms in Semi Conductor Diodes, Zener Diode Characteristics, Shunt Voltage Regulation using Zener Diode.

**UNIT II**

**TRANSISTORS, BIASING AND STABILIZATION**

The Bipolar Junction Transistor(BJT), Transistor Current Components, Transistor Construction, BJT Operation, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation, Transistor as an Amplifier, BJT Specifications, Principle of series voltage regulators. The DC and AC Load lines, Quiescent operating Point, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector-Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in $V_{BE,}$ $\beta_1$ and $I_{CO}$. Bias Compensation using Diodes, Thermistors and Sensistors, Thermal Runway, Thermal Stability.

**UNIT III**

**SMALL SIGNAL LOW FREQUENCY BJT AMPLIFIERS**

Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifiers CE, CC, CB configurations using h-parameters: voltage gain, current gain, Input impedance and Output impedance. Comparison of CB, CE, CC configurations in terms of $A_I$, $R_i$, $A_V$, $R_O$.

**UNIT IV**

**FET, BIASING AND AMPLIFIERS**

Construction and operation of Junction Field Effect Transistor (JFET), Volt-Ampere characteristics - Drain and transfer Characteristics, FET as Voltage Variable Resistor, Biasing FET, The JFET Small Signal Model, FET Common Source Amplifier, Common Drain Amplifier, Constructionand operation of MOSFET , MOSFET Characteristics in Enhancement and Depletion modes. Comparison of BJT and FET amplifiers.

**UNIT V**

**SPECIAL PURPOSE ELECTRONIC DEVICES**

Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram), Varactor Diode and schotky barrier diode.Principle of Operation and Characteristics of UJT, UJT Relaxation Oscillator.Principle of Operation of SCR, Schockley Diode, Diac and Triac. Principle of Operation of Semiconductor Photo Diode, PIN Diode ,Photo Transistor ,LED and LCD.

**TEXT BOOKS:**


1. Electronic Devices and Circuits by J.Millman, C.C.Halkias, and Satyabratha Jit, Tata McGraw Hill, 2nd Edition, 2007.
2. Electronic Devices and Circuits by R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 11th Edition, 2006.
3. Electronic Devices and Circuits by David A Bell, Oxford University Press, 5th edition 2008


**REFERENCES:**


1. Integrated Electronics - J.Millman and Christos.C.Halkias, and Satyabratha, Jit Tata McGraw Hill, 2nd Edition, 2008.
2. Electronic Devices and Circuits – T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th Edition, 2004.
3. Electronic Devices and Circuits- S. S Salivahanan, N. Sursh Kumar, A. Vallava Raju,2nd Edition., TMH, 2010.

**VNR Vignana Jyothi Institute of Engineering and Technology**

**II Year B.Tech EEE – I Sem**

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## (5EE02) NETWORK ANAYSIS
## (Common for EEE, ECE& EIE)

**Course Prerequisites:** Ordinary Differential Equations and Laplace Transforms,Circuit Theory

**Course Objectives:**

- To understand Three phase circuits.
- To analysis transients in Electrical systems.
- To evaluate Network parameters of given Electrical network and design of filters.
- To apply Fourier analysis to Electrical systems.

**Course Outcomes:**

After completion of this course the student is able to

- Describe The importance of three phase circuit for balanced and unbalanced conditions
- Analyze the transient behavior of electrical networks in time domain and frequency domain.
- Illustrate the concept of complex frequency, transform impedance, significance of poles and zeros of a given transfer function and network synthesis.
- Describe The properties of Fourier transforms and their applications to Electrical Systems.

**UNIT–I**

**THREE PHASE CIRCUITS**

Three phase circuits: Phase sequence – Star and Delta connection – Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits – Measurement of Active and Reactive Power- Different methods-Problems

**UNIT–II**

**TRANSIENT ANALYSIS**

Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transforms.

Response of R-L, R-C, R-L-C circuits for step, ramp, pulse and impulse excitation using Laplace Transform Methods.

**UNIT–III**

**NETWORK FUNCTIONS & SYNTESIS**

The Complex Frequency- concept -Physical interpretation - Transform Impedance and Transform Circuits, Series and parallel Combination of Elements, Terminal Pairs or Ports, Network Functions for One-port and Two-port, Poles and Zeros of Network Functions, Significance of poles and Zeros, Properties of Driving Point Functions, Properties of Transfer functions, Necessary Conditions for Transfer Functions, Time Domain Response

from Pole Zero Plot. ***Synthesis of one port LC, RL and RC networks – Foster and Cauer methods.***

**UNIT–IV**

**NETWORK PARAMETERS& FILTERS**

Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems. Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-k and M-derived filters-Low pass and High pass Filters (qualitative and quantitative treatment) and Band pass and Band elimination filters (quantitative treatment only), Illustrative problems.

**UNIT–V**

**FOURIER ANALYSIS OF A. C. CIRCUITS**

The Fourier theorem, consideration of symmetry, exponential form of Fourier series, line spectra and phase angle spectra, Fourier integrals and Fourier transforms, properties of Fourier transforms. Application to Electrical Systems – Effective value and average value of non sinusoidal periodic waveforms, power factor, effect of harmonics,

**TEXT BOOKS:**


1. Engineering circuit analysis by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Network Analysis by A. Sudhakar, Shyammohan Palli, Mc Graw Hill Company,
3. Fundementals of electric circuits by Charles k Alexander, Mathew N O Sadiku, Tata Mc Graw Hill Company, 3rd Edition


**REFERENCES:**


1. Network Analysis by M. E Van valkenburg, PHI.
2. Circuit Theory by A. Chakrabarti, Dhanipat Rai and Co., 6th edition.
3. Electric circuit analysis by C. L. Wadhwa, New Age international.
4. Electrical Circuits by David A. Bell, Oxford University press.
5. Basic circuit analysis by D. R, Cunningham and J. A Stuller, Jaico Publications.
6. Electrical Circuit theory by K. Rajeswaran, Pearson Education 2004.
7. Network Theory and Filter Design by Vasudev K. Aatre, Eastern Wiley Publishers, 1993.
8. Electric Circuits by Mahmood Nahvi, Joseph A edmister, Schaum's Outline,Fifth Edition.
9. Electric circuit analysis by B. Subrahmanyam, I. K international.

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| **II Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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**(5EE03) ELECTROMAGNETIC FIELD THEORY**

**Course Prerequisites:** Advanced Calculus, Circuit Theory

**Course Objectives:**

- To introduce the concepts of electric field
- To introduce the concepts magnetic fields
- To introduce the concept of time varying field
- To use field applications which will be utilized in the development of the theory for power transmission lines and electrical machines.

**Course Outcomes:**

After completion of this course the student is able to

- Apply concepts of Electrostatics and electro magnetic fields
- Compute the force, fields and energy for different charge and current configurations and also evaluate capacitance and inductance.
- Appreciate Maxwell's equations in electro static, magnetic and time varying fields

**UNIT – I**

**ELECTROSTATICS**

Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Gauss's law – Application of Gauss's Law – Maxwell's first law, div $\mathbf{D}=\rho_v$ Laplace's and Poisson's equations – Solution of Laplace's equation in one variable.

**UNIT – II**

**CONDUCTORS ,DIPOLE,DIELECTRIC& CAPACITANCE**

Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators.

Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions, Capacitance – Capacitance of parallel plate and spherical and co-axial capacitors with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity.

**UNIT – III**

**MAGNETO STATICS**

Static magnetic fields – Biot-Savart's law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's

second Equation, div**B**=0. Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, Curl **H**=$J_c$.

**UNIT – IV**

**FORCE IN MAGNETIC FIELDS AND MAGNETIC POTENTIAL**

Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field

Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations – vector Poisson's equations.

Inductance of solenoids, toroids and cables – Mutual inductance – energy stored in magnetic field and energy density

**UNIT – V**

**TIME VARYING FIELDS**

Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation, Curl E=-$\partial B/\partial t$ – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

**TEXT BOOKS:**


1. Engineering Electromagnetics by William H. Hayt & John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.
2. Electro magnetic Fields" by Sadiku, Oxford Publications


**REFERENCES:**


1. Introduction to Electro Dynamics by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd editon
2. Electromagnetics by J. D Kraus Mc Graw-Hill Inc. 4th edition 1992.
3. Electromagnetic fields, by S. Kamakshaiah, Right Publishers, 2007.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **II Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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**(5EE04) ELECTRICAL MACHINES-I**

**Course Prerequisites:** Circuit Theory, Electro Magnetic Field theory

**Course objectives:**

- To understand the Electro-mechanical Energy conversion
- To know the construction and operation of DC machines
- To know the different testing methods for dc machines
- To know the behavior of DC machines
- To learn about different speed and voltage control methods

**Course Outcomes :**

After completion of this course the student is able to

- Identify the different parts of a dc machine and their roles in its operation.
- Carry out different testing methods to predetermine the efficiency of DC machines
- Select a DC machine for particular practical application
- Start and to control voltage and speed of DC machines

**UNIT-I**

**ELECTROMECHANICAL ENERGY CONVERSION**

Law of energy conservation- Need of Electromechanical energy Conversion-Definition of Generator and Motor-Coupling medium-Role-Energy balance equation of a motor and generator-Singly excited electromagnetic systems-Energy-Co-energy- force expression-Multi excited systems-Torque expression-Problems

**UNIT-II**

**D.C GENERATORS (PART –I)**

D.C generator-principle-simple loop generator-Construction- DC Armature Windings-Lap and Wave windings-Development-Differences- emf equation-Classification of D.C. Generators -self excitation-open circuit characteristics-critical resistance and critical speed-problems.

**UNIT-III**

**D.C.GENERATORS (PART –II)**

Armature Reaction-Effects-Distribution of Field mmf and Armature mmf-Demagnetising and Cross magnetizing AT/pole-Compensating Windings-Problems-Commutation-Methods of Improving Commutation-Generator Characteristics-Power Stages- Losses-Efficiency-Parallel Operation-Problems

**UNIT-IV**

**D.C.MOTORS (PART –I)**

D.C.Motor-Principle-Function of Commutator-Types-Back emf-Voltage Equation-Mechanical Power developed-Condition for maximum mechanical power developed-Torque equation-Motor characteristics-Power stages- Efficiency-Condition for maximum efficiency-problems.

**UNIT-V**

**DC MOTORS (PART –II)**

Speed control-Field and Armature control methods - starting of D.C.Motors-3 point and 4 point starters-Design of starter steps-problems-Testing of D.C.Machines: Brake Test, Swin-Burne's Test, Hopkinson'sTest, Field's Test and Retardation Test, Problems, concept of Electrical Braking [Elementary Treatment only].

**TEXT BOOKS:**

1. Electric Machines by P.S. Bimbra-Khanna Publishers
2. Electrical Machines by A.E Fitzgerald, C.kingsely and S.Umans, MGH, 5th edition

**REFERENCES:**

1. Performance and Design of D.C machines by Clayton and Hancock, BPB publishers
2. Electrical machines by I.J Nagrath and D.P Kothari, TMH Publishers, 3rd edition
3. Fundamentals of Electrical machinery by Stephen Chapman, TMH Publishers
4. Electrical machines by Gordon.R.Slemon, Alan straughen, Addison – Wesley.co., 1980, 1st edition

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## (5EC03) SWITCHING THEORY AND LOGIC DESIGN
## (Common for EEE, ECE& EIE)

**Pre-requisites**

- Basic Electronics

**Course Objectives**

- To understand the concepts of number systems, codes and design of various combinational and synchronous sequential circuits
- To learn various methods to minimize the Boolean expressions for reducing the number of gates and cost
- To realize logic networks, digital computers using PROM, PLA, PAL devices.
- To design state machines and ASM charts

**Course Outcomes**

After Completion of the course the student is able to

- Represent Digital data in various formats
- Design and implement combinational and sequential circuits with minimized logic
- Design ASM charts for digital systems

**UNIT I**

**Number Systems and Codes**

Philosophy of number systems – complement representation of negative numbers-binary arithmetic-binary codes. -error detecting & error correcting codes –hamming codes.

**Boolean Algebra:** Fundamental postulates of Boolean algebra - Basic theorems and properties, Boolean functions and representations: SOP, POS, Truth table, Canonical and Standard forms-Algebraic simplification, Digital logic gates, properties of XOR gates – universal gates-Multilevel NAND/NOR realizations.

**UNIT II**

**Switching Functions**

**Minimization of Switching Functions:** Karnaught-Map method-upto 5 variables, Prime Implicants, don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime – Implicant chart, simplification rules.

**UNIT III**

**Combinational Logic Design**

Design using conventional logic gates, Half adder, Full adder, ripple carry adder, carry look ahead adder, BCD adder, Half subtractor, Full subtractor, Binary adder / subtractor. Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and

hazard free realizations.

**UNIT IV**

**SEQUENTIAL CIRCUITS – I**

Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic flip-flops-Triggering and excitation tables. Steps in synchronous sequential circuit design. Design of Synchronous and Asynchronous counters& Shift Registers, Serial binary adder, sequence detector.

**UNIT V**

**SEQUENTIAL CIRCUITS – II**

Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques. Introduction to ASM charts, simple examples, system Design using data path and control subsystems, ASM charts for Flip Flops and Binary multiplier

**TEXT BOOKS:**


1. Switching & Finite Automata theory – Zvi Kohavi, TMH,2nd Edition.
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.


**REFERENCES:**


1. An Engineering Approach To Digital Design – Fletcher, PHI. Digital Logic – Application and Design – John M. Yarbrough, Thomson.
2. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
3. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006
4. Modern Digital Electronics by R.P JAIN, TMH

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **II Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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## (5EE51) ELECTRICAL CIRCUITS AND SIMULATION LABORATORY

**Prerequisites:** Circuit Theory, Network Analysis

**Course Objectives:**

- To design electrical systems
- To analyze a given network by applying various Network Theorems
- To measure Three phase Active and Reactive power.
- To understand the locus diagrams

**Course Outcomes :**

After Completion of the course the student is able to

- Analyze complex DC and AC linear circuits
- Apply concepts of electrical circuits across engineering
- Evaluate response in a given network by using theorems
- Simulate the electrical circuits using suitable software

**PART-A**

1. Verification of Thevenin's and Norton's Theorems
2. Verification of Superposition and Reciprocity theorems
3. Verification of Compensation Theorem
4. Verification of and Maximum Power Transfer and Milliman's Theorems
5. Locus Diagrams of RL and RC Series Circuits
6. Series and Parallel Resonance
7. Determination of Self, Mutual Inductances and Coefficient of coupling
8. Determination of Z and Y Parameters
9. Determination of Transmission and Hybrid parameters
10. Measurement of Active Power for Star and Delta connected balanced loads
11. Measurement of Reactive Power for Star and Delta connected balanced loads
12. Measurement of 3-phase Power by two Wattmeter Method for unbalanced loads

**PART-B**

1. Simulation of DC Circuits
2. Transient Analysis
3. Mesh and Nodal Analysis
4. Thevinen's Theorem verification
5. Measurement of active Power of three phase circuit for balanced and unbalanced load

Minimum of Ten experiments (Eight from PART-A and Two from PART-B)need to be conducted

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **II Year B.Tech EEE – ISem** | **L** | **T/P/D** | **C** |
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## (5EC51) ELECTRONIC DEVICES AND CIRCUITS LABORATORY

**(Common for EEE, ECE& EIE)**

**Course Prerequisites:** Semiconductor Physics, Electronic Devices and Circuits Concepts

**Course Objectives**

- To identify various componentsand testing of active devices.
- To study the operation of multi-meters,function generators ,regulated power supplies and CRO
- To know the characteristics of various active devices.
- To study frequency response Amplifier.

**Course Outcomes**,

After completion of this course the student is able to

- Apply various devices to real time problems.
- Compute frequency response of various amplifiers.

**Part A: (Only for viva-voce Examination)**

**ELECTRONIC WORKSHOP PRACTICE (in 2 lab sessions):**

1. Identification, Specification, testing of R,L,C components (color codes), Potentiometers (SPDT, DPDT, and DIP),Coils, Gang Condensers, Relays, Bread Board, PCB's
2. Identification, Specification, testing of Active devices : Diodes, BJT, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of :
   - Multimeters (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - CRO

**Part B: (For Laboratory Examination – Minimum of 10 experiments)**

1. Forward and Reverse Bias V-I characteristics of PN junction Diode.
2. Zener diode V-I characteristics and Zener diode as voltage regulator.
3. Half Wave, and Full wave with and without filters.
4. Characteristics of a BJT under CE configuration and calculation of h-parameters.
5. Characteristics of a BJT under CC configuration and calculation of h-parameters.
6. Characteristics of a BJT under CB configuration and calculation of h-parameters.
7. FET characteristics under CS configuration.
8. Frequency response of CE Amplifier.
9. Frequency response of CC Amplifier.
10. Frequency response of CS FET Amplifier.
11. SCR characteristics.
12. UJT characteristics and Relaxation Oscillator.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **II B.Tech I Semester** | **L** | **T/P/D** | **C** |
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**(5BS04) GENDER SENSITIZATION**

(Common to All Branches)

**Objectives of the Course:**

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

**Learning Outcomes:**

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

**UNIT-I:**

**UNDERSTANDING GENDER:**

**Gender:** Why Should We Study It? (Towards a word of Equals: Unit-1)

**Socialization:** Making Women, Making Men (Towards a word of Equals: Unit-2)

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

**Just Relationships:** Being Together as Equals (Towards a world of Equals: Unit-12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters, Mothers and Fathers.

Further Reading: Rosa Parks-The Brave Heart.

**UNIT-II:**

**GENDER AND BIOLOGY:**

**Missing Women: Sex Selection and Its Consequences (Towards a word of Equals: Unit-4)**

Declining Sex Ratio.Demographic Consequences.

**Gender Spectrum: Beyond the Binary (Towards a word of Equals: Unit-10)**
Two or Many?Struggles with Discrimination.
**Additional Reading: Our Bodies, Our health (Towards a word of Equals: Unit-13)**

**UNIT-III:**
**GENDER AND LABOUR:**
**Housework: the Invisible Labour (Towards a word of Equals: Unit-3)**
"My Mother doesn't Work.""Share the Load."
**Women's Work: Its Politics and Economics (Towards a word of Equals: Unit-7)**
Fact and Fiction.Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

**UNIT-IV:**
**ISSUES OF VOILENCE:**
Sexual Harassment: Say No! (Towards a word of Equals: Unit-6)
Sexual Harassment: not Eve-Teasing-Coping with Everyday Harassment-Further Reading: "Chupulu".
**Domestic Violence: Speaking Out (Towards a word of Equals: Unit-8)**
Is Home a Safe Place?-When Women Unite [Film]. Rebuilding Lives. Further Reading: New Forums for Justice.
**Thinking about Sexual Violence (Towards a word of Equals: Unit-11)**
Blaming the Victim-"I fought for my Life..."- Further reading: The Caste Face of Violence.

**UNIT-V:**
**GENDER AND STUDIES:**
**Knowledge: Through the Lens of Gender (Towards a word of Equals: Unit-5)**
Point of View.Gender and the Structure of Knowledge. Further Reading: Unacknowledged Women Artists of Telangana.
**Whose History? Questions for Historians and Others (Towards a word of Equals: Unit-9)**
Reclaiming a Past.Writing Other Histories.Further Reading.Missing Pages from Modern Telangana History.

Essential Reading: all the Units in the Textbook, "Towards a word of Equals: A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Malkote, Vasudha Nagaraj, Asma rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.
Note: Since it is Interdisiplinary Course, Resouse Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

**REFERENCES:**
1. Sen, Amartya. "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. 'We Were Making History...' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.

2. Tripti Lahiri. “By the Numbers: Where Indian Women Work.” Women’s Studies Journal (14 November 2012) Available online at : http://blogs.wsj.com/India real time/2012/11/14/by-the-numbers-where-India-women-work/>
3. K. Satyanarayana and Susie tharu(Ed) Steel Nibs are Sprouting: New Dalit Writing from South India Dossier 2: Telugu and Kannada http://harpercollins.co.in/BookDetail.asp?Book Code =3732
4. Vimala . “Vantillu (The Kitchen)”. Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrughna, Veena et al. Women’s Work and its Impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. “ We Were Making History.....’Life Stories of Women in the Telangana People’s Struggle. New Delhi: Kali for Women, 1989.
7. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012.
8. Jayaprabha, A. “Chupulu (Stares)”, Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shayan and Anupam Manuhaar. “Women and wage Discrimination in India: A Critical Analysis.”International Journal of Humanities and Social Science Invention 2.4 (2013).
10. Gautam , Liela and Gita Ramaswamy. “A ‘conversation’ between a Daughter and a Mother.”Broadsheet on Contemporary Politics, Special issue on Sexuality and Harassment: gender Politics on Campus Today. Ed. Madhumeeta Sinha and Asma rasheed. Hyderabad: Anveshi Research Center for Women’s Studies, 2014.
11. Abdulali Sohaila “I Fought For My Life ...and Won. “Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jeganathan Pradeep, Partha Chatterjee (Ed). “Community, Gender and Violence Subaltern Studies XI’
Permanent Black and ravi Dayal Publishers, New Delhi, 2000.
13. K. Kapadia. The Violence of Development: the Politics of Identity, Gender and Social Inequalities in India. London: Zed Books, 2002.
14. S. Benhabib. Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics, London: Routledge, 1992.
15. Virginia Woolf. A Room of One’s Own. Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, Just Development: Beyond Adjustment with a Human Face, Karachi: Oxford University Press, 1997

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| **II Year B.Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**(5EE05) ELECTRICAL MACHINES – II**

**Course Prerequisites:** Electrical Machines-I, Circuit Theory, Electro Magnetic Field Theory

**Course objectives:**

- To understand the construction and operation of transformers and induction motors
- To know the importance of transformers in power systems for reducing transmission losses
- To know the different testing methods for transformers and induction motors
- To examine how induction motors are useful for electro-mechanical energy conversion
- To identify different methods of starting induction motors

**Course Outcomes:**

After completion of this course the student is able to

- Identify different parts of transformers and induction motors and to specify their functions
- Understand the operation of transformers and induction motors
- Carry out different testing methods and to assess the performance of transformers and induction motors
- Start and control an induction motor

**UNIT – I**

**TRANSFORMERS (PART-I)**

Transformer principle-Need of Transformer-construction-types of transformers-Emf equation-core losses- Ideal Transformer, practical transformer on No-load-phasor diagram-Excitation phenomenon, practical Transformer on load-phasor diagrams- Equivalent circuit - Inrush currents

**UNIT – II**

**TRANSFORMERS (PART-II)**

Voltage Regulation-Dependency of voltage Regulation on load power factor-losses-Efficiency-Condition for maximum efficiency- Testing of Transformers- Polarity Test - OC Test-SC Test- Sumpner's Test - Auto transformer- Power and Distribution Transformers differences-All day efficiency.

**UNIT – III**

**PARALLEL OPERATION AND THREE PHASE TRANSFORMERS**

Parallel operation – conditions-problems - construction of three phase transformer - Poly-phase connections - Y/Y, Y/$\Delta$, $\Delta$/Y, $\Delta$/$\Delta$ and open $\Delta$, Zig-Zag Connections - Third harmonics

in phase voltages-three winding transformers- Scott connection - On load tap changer, OFF load tap changer -cooling of a transformer.

**UNIT – IV**

**POLY PHASE INDUCTION MOTORS (PART-I)**

Three phase induction motors - construction – Types of rotors – Rotating Magnetic field – Principle of operation – Slip – Rotor frequency – Rotor Equivalent Circuit – Rotor Input – Mechanical Power developed- Complete equivalent circuit –Phasor diagrams at starting and running conditions – Losses and power flow –Efficiency- Torque Equation – Starting and maximum torque – Torque Slip Characteristics – Deep bar and double cage rotors.

**UNIT – V**

**POLY PHASE INDUCTION MOTORS (PART-II)**

Circle diagram: No load and Blocked rotor tests-Performance Analysis from circle diagram – starting of Induction motors – Different Starters – Speed control – Control from stator and rotor sides – Crawling and cogging -Induction Generator.

**TEXT BOOKS:**

1. Electrical machines by PS Bhimbra, Khanna Publishers.
2. Electric machinery by A.E. Fritzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies, 5th edition

**REFERENCES:**

1. Performance and Design of AC Machines by MG.Say, BPB Publishers
2. Theory of Alternating Current Machinery by Langsdorf, Tata McGraw-Hill Companies, 2nd edition.
3. Electric Machines by I.J.Nagrath and D.P.Kothari,Tata Mc Graw Hill, 7thEdition.2005
4. Electromechanics-II (transformers and induction motors) by S. Kamakashaiah, Hitech publishers.

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| **II Year B. Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**(5EC16) ELECTRONIC CIRCUITS**

**Course Prerequisites:** Electronic Devices and Circuits

**Course Learning Objectives**

- To explain the operation, design and Analysis of multistage amplifiers using BJT and MOSFET.
- To analyze feedback amplifiers, large signal and oscillators.
- To explain the operation of linear and non linear wave shaping circuits
- To understand the switching characteristics of diode and transistor

**Course Outcomes**

After completion of this course the student is able to

- Apply the knowledge of BJT to design practical amplifier circuits.
- Design electronic sub systems such as feedback amplifiers, oscillators and power amplifiers to meet the required specifications.
- Design linear and non linear wave shaping circuits with different inputs.
- Analyze multi vibrators using transistors.

**UNIT –I**

**MULTI STAGE AMPLIFIERS**

Multi Stage Amplifiers Methods of Inter Stage Coupling, n – Stage Cascaded Amplifier, Equivalent Circuits, Miller's Theorem, Frequency Effects, Amplifier Analysis, Transistor Circuits. Cascade – Transistor Configuration, CE-CC Amplifiers (Darlington Pair), Two Stage RC Coupled JFET amplifier (in Common Source configuration), Difference Amplifier.

**BJT and FET FREQUENCY RESPONSE**

Logarithms- Decibels- General frequency consideration- Low frequency analysis- Low frequency response of BJT amplifiers – Low frequency response of FET amplifier- Miller effect capacitance – High frequency response of BJT amplifier

**UNIT – II**

**FEEDBACK AMPLIFIERS**

Concept of feedback, Classification of feedback amplifiers, General characteristics of negative Feedback amplifiers, Effect of feedback on Amplifier characteristic- Voltage series- Voltage shunt, current series and Current shunt Feedback configurations- Illustrative problems

**OSCILLATORS**

Classification of oscillators, Conditions for oscillations, RC phase shift oscillator, Wien bridge oscillator, Generalized analysis of LC oscillators – Hartley and Colpitts oscillators, Piezoelectric crystal oscillator, Stability of oscillators

**UNIT-III**

**LARGE SIGNAL AMPLIIFERS**

Class-A Power Amplifier, Maximum Value of Efficiency of Class-A Amplifier, Transformer coupled amplifier- Push Pull Amplifier- Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier)-Phase Inverters, Transistor Power Dissipation, Thermal Runway, Heat Sinks.

**LINEAR WAVESHAPING**

High pass, Low pass RC circuits their response for sinusoidal, step pulse, square and ramp inputs.

**UNIT –I V**

**CLIPPERS AND CLAMPERS**

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, Applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

**SWITCHING CHARACTERISTICS OF DEVICES**

Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor- switching times.

**UNIT – V**

**MULTIVIBRATORS**

Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.

**TEXT BOOKS:**


1. Electronic Device and Circuit Theory, Robert L.Boylestad, Louis Nasheisky, 9th Edition 2007, Pearson Education
2. Electronic Devices and Circuits by S.Salivahanan, N.Suresh Kumar and A.Vallavaraj, 2nd edition 2008, Tata McGraw Hill Companies.
3. Solid State Pulse Circuits by David A Bell 4th Edition, Prentice Hall of India.


**REFERENCES:**


1. Introductory Electronic Devices and Circuits(Conventional flow version) – Robert T.Paynter, 7 Edition 2009,PEI.
2. Electronic Devices and Circuits, Anil K.Malin, Varsha Agrawal, Ist Edition,WILEY
3. Pulse, Digital and Switching Waveforms by Jacob Milliman , Harbert Taub and Mothiki S.Prakash rao, 2nd edition 2008, Tata McGraw Hill Companies.

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**(5BS41)BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**

**(Common for CE, EEE, ME, ECE, CSE, EIE & IT)**

**Course Prerequisites: Basic knowledge of Economics**

**Course Objectives:**

**The objective of this course is to:**

- To explain different forms of organizing private and public sector business enterprises and to analyze the significance of Business Economics in solving the problems of business enterprise. Also to define and analyze the concepts of Demand, Elasticity of Demand and Demand Forecasting Methods.
- To analyze the various types of costs and to determine the level of output at which there is neither profit nor loss. To estimate capital requirements and to describe various sources of mobilizing funds. Also to identify least cost combinations of inputs produce desired quantity of output.
- To describe the features of different market structure and pricing strategies.
- To explain the basic accounting concepts and conventions. To elaborate the importance of finance function for evaluating the economic status of a business unit.

**Course outcomes:**

**Upon completion of this course students should be able to:**

- Select the suitable form of business organization which meets the requirement of selected business also perform decision – making function effectively in an uncertain frame work by applying concepts of Managerial Economics. Meet and manipulate the demand efficiently and plan the future course of action.
- Apply right kind cost to reduce cost by paying attention towards the costs which can be reduced. Take decision whether to buy or produce? Reduce the cost of capital by selecting best source of fund mobilization and select best investment opportunity which yields higher rate of return.
- Fix the right price which can best meets the predetermined objectives of the business firm under different market conditions. Able to select best combination of inputs to produce required quantity of output.
- Prepare books of accounts and know over all financial position of the business enterprise which enables the concerned to take appropriate measures to improve the situation. Also interpret the financial position from difference angles and initiates the measures/ efforts in that direction.

**UNIT I**

**Business and new economic environment**

Characteristic features of business; Features and evaluation of sole proprietorship; Partnership; Joint stock company; Public enterprises and their types; Changing business environment in post- liberalization scenario.

**UNIT II**

**Introduction to business economics, and demand analysis**

Definition; Nature and scope of managerial economics - demand analysis determinants; Law of demand and its exceptions.

**Elasticity of demand and demand forecasting**

Definition; Types; Measurement and significance of elasticity of demand; Demand forecasting; Factors governing demand forecasting; Methods of demand forecasting - survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, and judgmental approach to demand forecasting.

**UNIT III**

**Cost analysis**

Cost concepts - opportunity cost, fixed vs. variable costs, explicit costs vs. implicit costs, and out of pocket costs vs. imputed costs; Break-even analysis (BEA) - determination of break-even point (simple problems), managerial significance, and limitations of BEA.

**Capital and capital budgeting**

Capital and its significance; Types of capital; Estimation of fixed and working capital requirements; Methods and sources of raising finance.

Nature and scope of capital budgeting; Features of capital budgeting proposals; Methods of capital budgeting - payback method, accounting rate of return (ARR), and net present value method (simple problems)

**UNIT IV**

**Theory of production**

Production function - isoquants and isocosts, least cost combination of inputs, and laws of returns; Internal and external economics of scale.

**Market structures**

Types of competition; Features of perfect competition, monopoly, and monopolistic competition; Price-output determination in case of perfect competition and monopoly.

**Pricing policies and methods**

Cost plus pricing; Marginal cost pricing; Sealed bid pricing; Going rate pricing, Limit pricing, Market skimming pricing, Penetration pricing, Two-part pricing, Block pricing, Bundling pricing, Peak load pricing, Cross subsidization.

**UNI T V**

**Introduction to financial accounting**

Double-entry book keeping; Journal; Ledger; Trial balance; Final accounts - trading account, profit and loss account, and balance sheet with simple adjustments.

**Financial analysis through ratios**

Computation; Analysis and interpretation of liquidity ratios - current ratio, and quick ratio; Activity ratios - inventory turnover ratio, and debtor turnover ratio; Capital structure ratios –

debt-equity ratio, and interest coverage ratio; Profitability ratios - gross profit ratio, net profit ratio, operating ratio, P/E ratio, and EPs.

**TEXT BOOKS**


1. Managerial Economics and Financial Analysis *by*Aryasri, 2009; *Publisher: Tata McGraw Hill*.
2. Managerial Economics *by*Varshney&Maheswari, 2009; *Publisher: Sultan Chand*.


**REFERENCES**


1. Financial Accounting for Management: An analytical perspective *by*Ambrish Gupta, 2010; *Publisher: Pearson Education*.
2. Managerial Economics *by* H. Craig Peterson & W. Cris Lewis; *Publisher: Prentice Hall of India*.

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| **II Year B.Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**(5EE06) POWER SYSTEMS-I**

**Course Prerequisites:** Environmental Studies, Physics

**Course Objectives:**

- To explain the various generation sources such as Hydro, Thermal, Nuclear and Gas Power plants
- To describe DC and AC distribution systems and its voltage drop calculations
- To illustrate various Economic aspects of the Power plant erection, operation and different Tariff methods.
- To describe various power factor improvement methods.

**Course Outcomes**

After completion of this course the student is able to

- Draw and explain the layouts of Hydro Power Plant, Thermal Power station Nuclear Power Plant and Gas Power plant
- Derive the equations for voltage drops in DC and AC distribution systems
- Define Load, diversity, demand and Plant use factors
- Describe various Tariff methods and various Power factor improvement methods

**UNIT-I**

**HYDRO POWER PLANTS**

Hydro Power Stations: Choice of site, arrangement of hydroelectric installations, Hydrology, Mass curve, flow duration curve, classification of Hydro Power Plants, pumped storage plants.

**UNIT-II**

**THERMAL POWER STATIONS**

Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses- Description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Electrostatic Precipitators, Chimney, and Cooling towers.

**UNIT-III**

**NUCLEAR, GAS POWER PLANTS AND SUBSTATIONS**

Nuclear Power Stations: Nuclear Fission and Chain reaction- Nuclear fuels- Principle of operation of Nuclear reactor-Reactor Components: Moderators, Control rods, Reflectors and Coolants- Radiation hazards: Shielding and Safety precautions- Brief description of PWR, BWR and FBR. Gas power plant- Layout

**SUBSTATIONS**: Air Insulated and Gas Insulated Substations - Layouts - comparison

**UNIT-IV**

**DISTRIBUTION SYSTEMS**

Classification of Distribution Systems - Comparison of DC Vs AC Distribution Systems - Requirements and Design features of Distribution Systems-Voltage Drop Calculations in D.C Distribution system for the following cases-Radial system - fed at one end - fed at both the ends with equal and unequal Voltages, Ring Main Distribution system. Voltage Drop Calculations in A.C. Distribution system for the following cases - Power Factors referred to receiving end voltage, with respect to respective load voltages, Numerical problems

**UNIT-V**

**ECONOMIC ASPECTS OF POWER PLANTS**

Load curve and Load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems. Desirable Characteristics of Tariff-Tariff Methods: Flat Rate, Block- Rate, two-part, three –part, and power factor tariff methods, effect of load factor, demand and diversity factors on the cost of electrical energy and power factor improvement, Economical Power factor- problems.

**TEXT BOOKS:**


1. Generation and utilization of Electrical Energy – C.L.Wadhawa, New age International (P) Limited, Publishers 1997.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai and Co. Pvt. Ltd, 1999.


**REFERENCES:**


1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta, S.Chand & Company Ltd, New Delhi, 2004.

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**(5ME25) FLUID MECHANICS & HYDRAULIC MACHINES**

**Course Prerequisites:** Maths, Physics and Engineering Mechanics

**Course Objectives:**

- Understand the properties of fluids, principles of buoyancy, flow, force and head calculations.
- Understand the hydro dynamic force and impact of jet.
- Principles of operation of different types of hydraulic turbines.
- Principles of operation of different types of hydraulic pumps.

**Course Outcomes:**

After completion of this course the student is able to

- Apply the knowledge of fluids and properties to solve flow, force and velocity problems.
- Apply the knowledge to find the head loss due to friction inpipe and other losses
- Apply the knowledge of fluid flow and dynamics in solving problems in hydraulic machines.
- Perform model analysis of hydraulic machinery and select appropriate machines for hydro power plant.

**UNIT - I**

**FLUID STATICS**

Properties of fluid – specific gravity, viscosity, surface tension, vapor pressure and their influence on fluid motion, Pressure at a point, measurement of pressure.

**FLUID KINEMATICS**

Classification of flows, acceleration equations, Streamline, path line and streak lines and stream tube, continuity equation, Stream function, velocity potential function.

**UNIT - II**

**FLUID DYNAMICS**

Surface and body forces – Euler's and Bernoulli's equation, Venturimeter, Orifice meter, Pitot tube, Reynolds experiment –Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel. Momentum equation.

**UNIT - III**

**BASICS OF TURBO MACHINERY**

Hydrodynamic force of jets on flat, inclined and curved vanes - jet striking centrally and at tip, flow over radial vanes.

**ELEMENTS OF HYDROELECTRIC POWER STATION**

Types of power plants, storage requirements, estimation of power from a given catchment area, head and efficiency.

**UNIT - IV**

**HYDRAULIC TURBINES**

Classification of turbines, design of Pelton wheel, Francis turbine and Kaplan turbine – working proportion, work done, efficiency, draft tube-theory, functions and efficiency.Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank and water hammer.

**UNIT - V**

**HYDRAULIC PUMPS**

Classification, centrifugal pumps – types, working, work done, manometric head, losses and efficiency, specific speed – pumps in series and parallel – performance characteristic curves, NPSH.Reciprocating Pump – types, Working, Discharge, slip, indicator diagrams.

**TEXT BOOKS:**


1. Hydraulics And Fluid Mechanics Including Hydraulics Machines by Dr. P.N.Modi, Dr. S.M. Seth, Standard book house,2009.


**REFERENCES:**


1. Fluid Mechanics & Hydraulic Machines by R.K.Rajput, S Chand & Co Ltd, 3rd Rev. Edition, 2006.
2. Fluid mechanics - fundamentals & applications by Yunus A. Çengel, John M. Cimbala, McGraw-Hill Higher Education, 2006
3. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Lakshmi Publications, 2005

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**(5EE52) ELECTRICAL MACHINES-I LABORATORY**

**Course Prerequisites:** Electrical Machines-I,

**Course Objective:**

- To expose the students to the operation of DC Machines.
- To perform different tests on transformers and DC machines
- To know different methods of controlling the speed of dc motors
- To examine the self excitation phenomenon in DC generators

**Course Outcomes:**

After completion of this course the student is able to

- Start and control the different DC Machines.
- Assess the performance of different machines using different testing methods
- Identify different conditions required to be satisfied for self excitation of DC Generators
- Separate iron losses of DC machine into different components

**Part - A**

1. Magnetization characteristics of DC shunt generator
2. Swinburne's Test on D.C.Shunt Machine
3. Brake test on D.C.Shunt motor
4. Speed control of D.C.Shunt Motor
5. Separation of losses of a D.C. Shunt Machine
6. Load Test on D.C.Shunt Generator
7. Load Test on D.C.Series Generator
8. Hopkinson's Test on a Pair of Identical D.C. Shunt Machines
9. Field's Test on a pair of Identical D.C. Series Machines
10. Open circuit and short circuit tests on single phase Transformer

**Part - B**

11. Load Test on single phase Transformer
12. Magnetization Characteristics of D.C.Series Generator
13. Retardation Test on D.C.Shunt Motor
14. Load Characteristics' of D.C.Compound Generator
15. Brake Test on D.C.Compound Motor
16. No load and Load Characteristics of Separately Excited D.C.Generator

Minimum of Ten experiments (Eight from PART-A and Two from PART-B) need to be conducted

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| **II Year B.Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**(5EC61)ELECTRONIC CIRCUITS LABORATORY**

**Course Prerequisites:** Electronic Devices and Circuits

**Course Objectives**

- To design and simulate various BJT and FET Voltage and Power amplifiers.
- To design and simulate various BJT Feedback amplifiers.
- To design and simulate various BJT Oscillators.
- To design and simulate linear and non linear wave shaping circuits.

**Course Outcomes**

After completion of this course the student is able to

- Apply the concepts of amplifiers in the design of Public Addressing System
- Generate Sinusoidal wave forms
- Design stable system using feedback concepts.
- Design multi vibrator using transistor

1. CE Amplifier.
2. CC Amplifier.
3. FET Amplifier.
4. Linear wave shaping.
5. Non Linear wave shaping – Clippers.
6. Non Linear wave shaping – Clampers.
7. Transistor as a switch.
8. Study of Logic Gates and Some applications.
9. Study of Flip-Flops and some applications.
10. Astable Multivibrator.
11. Monostable Multivibrator.
12. Bistable Multivibrator.
13. Hartley Oscillator
14. RC phase shift Oscillator using BJT.
15. Current shunt and voltage series feedback amplifier.

Any Ten of the above experiments are to be conducted.

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**II Year B.Tech EEE –II Sem**

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## (5ME69) FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

**Course Prerequisites:** Fluid Mechanics& Hydraulic Machines

**Course Objectives**

- Conduct the experiments to understand the concept, find the values and obtain the result of experiments.
- Apply fundamental principles of fluid mechanics for the solution of practical mechanical engineering problems of water conveyance in pipes, orifices, mouth pieces, notches & weirs.
- Understand various pumps, water turbines, pipes and pressure measurement devices.
- Understand the various types of Flows.

**Course Outcomes:**

After completion of this course the student is able to

- Verification of Bernoulli theorem Model and analyze fluid flow problems in mechanical engineering.
- Conduct experiments in pipe flows and open-channel flows and interpreting data from model studies to prototype cases.
- Correlate the experimental results with theoretical concepts.
- Design a model of any one type of Turbine or Pump

1. Calibration of venturimeter - orifice meter.
2. Calibration of triangular notches.
3. Determination of friction factor for a given pipe line.
4. Determination of Minor losses for the given pipe fittings
5. Impact of jets on vanes.
6. Performance test on Pelton wheel.
7. Performance test on Francis turbine.
8. Performance test on Kaplan turbine.
9. Performance test on single stage centrifugal pump.
10. Performance test on multi stage centrifugal pump.
11. Performance test on reciprocating pump.

Any Ten experiments are to be conducted.

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**III Year B.Tech EEE – I sem** **L T/P/D C**

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**(5EE07)ELECTRICAL MACHINES – III**

**Course Prerequisites:** Electrical Machines(I, II, III), Electro Magnetic Field Theory

**Course objectives:**

- To examine how synchronous machines are useful for electro-mechanical energy conversion
- To understand the construction and operation of synchronous machines
- To learn about different methods of finding voltage regulation of a synchronous machine
- To find advantages and methods of synchronization
- To know how the active and reactive power flows get controlled in a synchronous machine
- To understand the construction and operation of fractional HP machines.

**Course Outcomes :**

After completion of this course the student is able to

- Identify the different parts and their functions of synchronous machines
- Control the both active and reactive power flows in a synchronous machines
- Assess the performance of synchronous machine using different methods and to understand the operation
- Understand the operation of fractional HP machines and to select them as control system components.

**UNIT – I**

**FUNDAMENTALS OF SYNCHRONOUS GENERATORS**

Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance, synchronous reactance and impedance –phasor diagram – load characteristics.

**UNIT – II**

**REGULATION OF SYNCHRONOUS GENERATORS**

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of $X_d$ and $X_q$ (Slip test) Phasor diagrams – Regulation of salient pole Alternators.

**UNIT – III**

**PARALLEL OPERATION OF SYNCHRONOUS GENERATORS**

Synchronization of Alternators with infinite bus – Methods of Synchronization-synchronizing power and torque –load sharing – Numerical Problems - Effect of change of excitation and

mechanical power input.Short circuit Analysis – determination of sub-transient, transient and steady state reactances.

**UNIT – IV**

**SYNCHRONOUS MOTORS**

Construction and types of Synchronous Motors – Methods of Starting – Synduction Motor. Variation of current and power factor with excitation control – phasor diagrams – V and Inverted V Curves. Synchronous condenser – Applications - Problems - Mathematical analysis for power developed. Excitation and power circles – hunting and its suppression.

**UNIT – V**

**SINGLE PHASE MOTORS**

Single phase induction motor – Double field revolving theory –Equivalent Circuit of I-phase induction motor, Elementary idea of cross-field theory – split-phase – Capacitor start – Capacitor run motors - shaded pole motors. Principle and performance of A.C. Series motor-Universal motor – Principle of permanent magnet and reluctance motors, Stepper Motor.

**TEXT BOOKS:**


1. Electric Machines by I.J.Nagrath and D.P.Kothari, Tata Mc Graw Hill Publishers, 7th Edition 2005.
2. Electrical Machines by P.S. Bimbra, Khanna Publishers.


**REFERENCES:**


1. The Performance and Design of A.C.Machines by M.G.Say, ELBS and Ptiman and Sons.
2. Electric Machinery by A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw-Hill Companies, 5th edition, 1990.
3. Theory of Alternating Current Machinery by Langsdorf, Tata Mc Graw-Hill, 2nd edition.
4. Fundamentals of Electrical Machines by Stephen Chapman, Tata Mc Graw-Hill Publishers .
5. Electromachanics-III (Synchronous and single phase machines) by S.Kamakashiah, Right Publishers.

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**III Year B.Tech EEE – I Sem** **L T/P/D C**

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**(5EE08) CONTROL SYSTEMS**

**(Common for EEE, ECE& EIE)**

**Course Prerequisites:** Ordinary Differential Equations and Laplace Transform,

**Course objectives:**

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

**Course outcomes:**

After completion of this course the student is able to

- How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application
- Apply various time domain and frequency domain techniques to assess the system performance
- Apply various control strategies to different applications (example: Power systems, electrical drives etc…)
- Test system Controllability and Observability using state space representation and applications of state space representation to various systems.

**UNIT – I**

**INTRODUCTION**

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems.

Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

**UNIT II**

**TRANSFER FUNCTION REPRESENTATION AND TIME RESPONSE ANALYSIS**

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter, Receiver and Magnetic amplifier.

Block diagram Reduction–Signal flow graphs - Mason's gain formula – Numerical Problems.

Standard test signals - Time response of first order systems –Transient response of second order systems, Characteristic Equation of feedback control systems, Time domain

specifications – Steady state response - Steady state errors and error constants – Effects of Feedback on System Performance

**UNIT –III**

**STABILITY ANALYSIS IN S-DOMAIN**

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

**ROOT LOCUS TECHNIQUE & PID CONTROLLERS**

The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

Effects of P,PD,PI and PID Controllers.

**UNIT – IV**

**FREQUENCY RESPONSE : STABILITY ANALYSIS & COMPENSATORS**

Introduction, Frequency domain specifications-Bode plot- transfer function from the Bode plot-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots-Nyquist Plots-Stability Analysis.

Compensators: Lead, Lag, Lead-Lag Compensators on System Performance.

**UNIT – V**

**CLASSICAL CONTROL DESIGN TECHNIQUES AND STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS**

Concepts of state, state variables and state models,State Transition Matrix and it's Properties –Transformations : State Space to Transfer Function and Transfer Function to State Space. Concepts of Controllability and Observability.

**TEXT BOOKS:**


1. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.
2. Automatic Control Systems 8th edition by B. C. Kuo 2003– John wiley and son's.,


**REFERENCES:**


1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engineering. by NISE, John wiley, 3rd Edition.
4. Modelling and Control Of Dynamic Systems by Narciso F. Macia George J. Thaler, Thomson Publishers.
5. Modern control system theory by M.Gopal, New age international publishers, Revised second edition.
6 Control Systems by R.C. Sukla, Dhanpathrai Publications

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **III Year B.Tech EEE – I sem** | **L** | **T/P/D** | **C** |
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**(5EE09) POWER SYSTEMS-II**

**Course Prerequisites**:Circuit Theory, Electro Magnetic Fields, Power System-I

**Course Objectives:**

- To describe Transmission line parameters and derive its expressions for various configurations and analyze different types of Transmission lines
- To describe Traveling wave theory and derive expressions for reflection and refraction coefficients with various terminations of the lines
- To perform sag-tension calculations and also describe various types of Insulators
- To illustrate different types of cables and also describe grading of cables

**Course Outcomes**

After completion of this course the student is able to

- Derive L and C expressions for various configurations and analyze different types of Transmission lines
- Describe Traveling wave theory and derive expressions for reflection and refraction coefficients with various terminations of the lines
- Derive expressions for sag with equal and unequal height towers and describe various types of Insulators and also explain various string efficiency improvement methods
- Illustrate different types of cables and derive capacitance expressions and describe grading of cables

**UNIT-I**

**TRANSMISSION LINE PARAMETERS**

Types of conductors - calculation of resistance for solid conductors –Calculation of inductance for single phase and three phase, single and double circuit lines with symmetrical and unsymmetrical conductor configuration with and without transposition, concept of GMR and GMD, Numerical Problems, Skin and Proximity effects. Calculation of capacitance for single phase and three phase, single and double circuit lines with symmetrical and unsymmetrical conductor configuration, effect of ground on the capacitance of single phase line,Numerical Problems.

**UNIT-II**

**PERFORMANCE OF TRANSMISSION LINES**

Classification of Transmission Lines, Performance of Short, medium lines –Nominal-T, Nominal- π Networks and its A, B, C, D Constants - Numerical Problems.

Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Representation of Long Lines - Equivalent-T and Equivalent- π network models- Numerical problems - Ferranti effect.

**UNIT – III**

**POWER SYSTEM TRANSIENTS AND CORONA**

Types of System Transients - Travelling wave theory - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions. Bewley's Lattice Diagrams-Numerical Problems.

Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference - Problems.

**UNIT-IV**

**MECHANICAL DESIGN AND OVERHEAD LINE INSULATORS**

Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

Types of Insulators, String efficiency and Methods of improvement-Capacitance grading and Static Shielding - Numerical Problems.

**UNIT-V**

**UNDERGROUND CABLES**

Construction, types of Insulating materials, Types of Cables,Insulation resistance, Capacitance of Single and 3-Core belted cables-Numerical Problems.

Grading of Cables - Capacitance grading, Inter-sheath grading - Numerical Problems.Comparison of Over Head Lines and Under Ground Cables.

**TEXT BOOKS:**


1. Power System Engineering by I.J.Nagarath and D.P.Kothari, Tata Mc Graw Hill.
2. Electrical power systems by C.L.Wadhwa, New Age International (P) Limited, Publishers,1998.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai and Co Pvt. Ltd.


**REFERENCES:**


1. Power system Analysis-by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
3. Modern Power system Analysis by I.J.Nagrath and D.P.Kothari: Tata McGraw-Hill Publishing Company, 2nd edition.
4. Power System Analysis by Hadi Saadat, TMH Edition.
5. Principles of Power Systems by V.K.Mehata and Rohit Mehta, S.Chand & Company Ltd., New Delhi , 2004

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| **III Year B.Tech EEE – I sem** | **L** | **T/P/D** | **C** |
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## (5EE10) POWER ELECTRONICS

**Course Prerequisites**: Circuit Theory, Network Analysis, Electronic Devices and Circuits.

**Course objectives**

The student should be able

- To Design/develop suitable power converter for efficient control or conversion of power in drive applications
- To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications.

**Course Outcomes**

After completion of this course the student is able to

- understand the operating characteristics of various power electronic devices and their protection.
- Analyze operating principles of different converters and find their applications.
- Understand the control range/ control methodologies for various power electronic converters.

**UNIT-I**

**POWER SEMICONDUCTOR DEVICES**

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics

Basic theory of operation of SCR – Static and Dynamic characteristics of SCR - Salient points - Two transistor analogy-UJT firing circuit – Series and Parallel connections of SCRs - Snubber circuit details – Specifications and Ratings of SCRs, BJT, MOSFET, IGBT, Numerical problems, natural and forced commutation (Principle only).

**UNIT-II**

**SINGLE PHASE CONTROLLED CONVERTERS**

Single Phase Half Controlled Converters: Half controlled converters with R, RL and RLE loads – Derivation of average load voltage and current - without and with free-wheeling Diode – Numerical problems

Single Phase Fully controlled Converters: Mid point and Bridge connections with R, RL and RLE loads- Derivation of average load voltage and current - Performance parameters of single phase full bridge converter, Effect of source inductance – Derivation of load voltage and current- Numerical problems.

**UNIT-III**

**THREE PHASE CONTROLLED CONVERTERS**

Three Phase Converters – Three pulse and six pulse converters – Mid point and bridge connections, average load voltage with R and RL loads – Effect of Source inductance – Numerical Problems.

**UNIT-IV**

**AC VOLTAGE CONTROLLERS**

Single phase AC voltage controllers with R and RL loads-wave forms – Modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor – Numerical problems

**CYCLO CONVERTERS**

Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only)-Bridge configuration of single phase cyclo converter (Principle of operation) – Wave forms

**Unit -V**

**CHOPPERS**

Time ratio control and Current limit control strategies – Steady state Analysis of Buck and Boost converter with continuous mode of operation - Numerical Problems.

**INVERTERS**

Single phase inverter –half and full bridge inverter – Wave forms—performance parameters of inverters– Voltage control techniques for inverters, Pulse width modulation techniques-single, multiple and sinusoidal PWM Numerical Problems- Three Phase Inverters : analysis of 180 degree and 120 degree modes of operation with resistive, inductive loads - Numerical Problems.

**TEXT BOOKS:**


1. Power Electronics by Mohammed H. Rashid, Pearson Education, Third Edition, First Indian reprint 2004.
2. Power electronics, by P S Bimbhra, Khanna Publishers.
3. Power Electronics by Ned Mohan, Tore M. Undeland and William P. Robbins, John Wiley and Sons, Second Edition.


**REFERENCES:**


1. Fundamentals of Power electronics and Drives by A.Chakrabarti, Dhanpat Rai & Co, 2008
2. Power electronics, by P C Sen, Tata McGraw-Hill Education.
3. Thyristorised Power Controllers by S R Doradla,A Joshi,R .M K Sinha G K Dubey, New Age Books
4. Power Electronics by M D SINGH, K B KANCHANDHANI, Tata McGraw-Hill Publishing Company, second edition, 2006
5. Power Electronics by Vedam Subramanyam, New Age International Pvt Ltd Publishers, Revised Second Edition, 2008

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| **III Year B.Tech EEE - I Sem** | **L** | **T/P/D** | **C** |
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## (5CE71) DISASTER MANAGEMENT

**Course Objectives**

- Understand the difference between a hazard and disaster
- Know about various disasters and their impacts
- Understand Different approaches of disaster risk reduction
- Understand Disaster risks in India

**Course Outcomes**

**After Completion of the course the student is able to**

- Acquire the knowledge of disaster Management
- Understand the vulnerability of ecosystem and infrastructure due to a disaster
- Acquire the knowledge of Disaster Management Phases
- Understand the hazard and vulnerability profile of India

**UNIT I**

**Introduction to disaster**

Concepts and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks)

**UNIT II**

**Disasters: Classifications, Causes, Impacts** (including social, economic, political, environment, health, psychosocial, etc.)

Differential impacts-in terms of caste, class, gender, age, location, disability Global trends in disasters. Urban disaster, pandemics, complex emergencies, Climate change

**UNIT III**

**Approaches to disaster Risk reduction**

Disaster cycle-its analysis, phase, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural measures, roles and responsibilities of community. Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, center and other stake-holders.

**UNIT IV**

**Inter-relationship between Disaster and Development**

Factors affecting Vulnerabilities, differential impacts, impact of development projects such as dams, embankments, change in land-use etc. Climate change Adaption. Relevance of indigenous knowledge, appropriate technology and local resources.

**UNIT V**

**Disaster Risk Management in India**

Hazard and vulnerability profile of India

Components of Disaster relief: Water, food, sanitation, shelter, health, waste management Institutional arrangements (Mitigation, Response and Preparedness, DM Act Policy, Other related polices, plan, programmes and legislation)

**Project Work : (Field Work, Case Studies)**

The project/fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard.

**SUGGESTED READING LIST:**


1. Alexander David, Introduction in 'Confronting Catastrophe', oxford University press, 2000
2. Andharia J. Vulnerability in disaster Discourse, JTCDM, Tata Institute of Social Sciences working paper no.8, 2008
3. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disaster, Rutledge.
4. Coppola P Damon, 2007. Introduction to International Disaster Management.
5. Carter, Nick 1991.Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
6. Cuny,F.1983. Development and Disasters, Oxford University Press
7. Govt.of India; Disaster Management Act 2005,Government of India, New Delhi.

| III Year B.Tech EEE – I sem | L | T/P/D | C |
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## (5EE71) RENEWABLE ENERGY TECHNOLOGIES

**Course Objectives:**

• To provide necessary knowledge about the modeling, design and analysis of various PV systems
• To show that PV is an economically viable, environmentally sustainable alternative to the world's energy supplies
• To understand the power conditioning of PV and WEC system's power output

**Course Outcomes:**

After Completion of the course the student is able to
• Model, analyze and design various photovoltaic systems
• Know the feasibility of various storage systems
• Design efficient stand alone and grid connected PV and WEC power systems

**UNIT I**

**Introduction to photovoltaic (pv) systems:**

Historical development of PV systems- Overview of PV usage in the world Photovoltaic effect-conversion of solar energy into electrical energy.

**Solar cells and arrays**

Behavior of solar cells-basic structure and characteristics: types - equivalent circuit-modeling of solar cells including the effects of temperature, irradiation and series/shunt resistances on the open-circuit voltage and short-circuit currentSolar cell arrays- PV modules-PV generators- shadow effects and bypass diodes- hot spot problem in a PV module and safe operating area- Terrestrial PV module modelingInterfacing PV modules with different loads.

**UNIT II**

**Energy storage alternatives for pv systems**

Methods of Energy storage –Pumped Energy Storage – Compressed Energy Storage – Storage batteries- lead-acid- nickel cadmium-nickel-metal-hydride and lithium type batteries. Small storage systems employing ultra capacitors- properties- modeling of batteries.

**UNIT-III**

**Wind Energy Conversion systems (WECS)**

Basic Principle of WECS, Nature of Wind, Wind survey in india, Components of WECS, Power Vs Speed, TSR, Maximum Power operation, WECS- Trade off- Control Requirements, Basic Principle of Induction generator for WECS

**UNIT-IV**

**Converters for PV and Wind**

AC-DC Rectifier, DC-AC inverter (Basic operation) Grid interface voltage and frequency control, Battery charger (Basic operation)

**Power conditioning of PV systems**

Array Design, Sun Tracking, Single axis-Dual Axis, Maximum Power point Tracking- PO method- IC method

**UNIT-V**

**Stand Alone systems:**

PV Stand Alone, Electric Vehicle, Wind stand Alone, Standalone Hybrid systems- Hybrid with diesel, Hybrid with Fuel cell- Mode controller- Load sharing, systems sizing, wind farm sizing- Power and Energy estimates, , Residential systems, PV water pumping, PV powered lighting-

**TEXT BOOKS**

**1.** Patel M. R., "Wind and Solar Power Systems Design, Analysis, and Operation", CRC Press, New York, 2nd Edition, 2005

2. Goetzberger, Hoffmann V. U., "Photovoltaic Solar Energy Generation", SpringerVerlag,Berlin, 2005.

**REFERENCES**

1. Komp R.J., "Practical Photovoltaics: Electricity from solar cells", Aatec Publications,Michigan, 3rd Edition, 2001.

2. Castaner L., Silvestre S., "Modeling Photovoltaic Systems Using PSpice", John Wiley & Sons, England, 2002.

3. Jenny Nelson, "The physics of solar cells", Imperial College Press, London, 2004.

| III Year B.Tech EEE - I Sem | L | T/P/D | C |
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## (5ME71) DIGITAL FABRICATION

**Course Objectives:**

- Understand the need of digital fabrication
- Understand about Two dimensional layer by layer techniques
- Know about extrusion based systems, post processing and the software issues involved in digital fabrication
- Know the applications of digital fabrication

**Learning Outcomes:**

Students will be able to:

- Understand the importance of digital fabrication
- Identify different techniques involved in two dimensional layering
- Analyze the software issues involved in digital fabrication and know about extrusion based systems and post processing
- Apply the knowledge gained in the digital fabrication

**UNIT I:**

**Introduction to Additive Manufacturing:** Introduction to AM, AM evolution, Classification of Additive Manufacturing,Distinction between AM & CNC Machining, Advantages of AM

**UNIT II:**

**Two- Dimensional Layer- by Layer Techniques:** Stereolithography (SL), Solid Foil Polymerization (SFP), Selective Laser Sintering (SLS), Selective Powder Building (SPB), Ballistic Particle Manufacturing (PM).

**UNIT III:**

**Extrusion Based Systems:** Introduction, basic principles, Fused Deposition Modeling, Materials, Limitations of FDM

**Post Processing**: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements.

**UNIT IV:**

**Software Issues for Additive Manufacturing:** Introduction, Preparation of CAD Models: The STL file, Problems with STL files, STL file manipulation, Beyond the STL file, Additional software to assist AM

**UNIT V:**

**AM Applications**

Applications in design, Applications in Engineering Analysis and Planning
Medical Applications: Customized Implants and Prosthesis
Aerospace applications and Automotive Applications
Other Applications: Jewelry Industry, Coin Industry, Tableware Industry.

**TEXT BOOKS:**


1. Ian Gibson, David W Rosen, Brent Stucker, “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer 2010.

2. Chuaa Chee Kai, Leong Kah Fai, “Rapid Prototyping: Principles & Applications”, World Scientific, 2010.


**REFERENCES:**


1. Ali K.Karmani, EmandAbouel Nasr, “Rapid Prototyping: Theory and Practice”, Springer 2006.

2. Andreas Gebhardt, Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Hanser Publishers, 2013.

3. Hopkinson, N.Haque, and Dickens Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Taylor and Francis, 2007.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **III Year B.Tech EEE - I Sem** | **L** | **T/P/D** | **C** |
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**(5EC71) PRINCIPLES OF ELECTRONIC COMMUNICATIONS**

**Course Objective**

- To make students understand different types of communication.
- To make students understand different modulation technique
- To make students understand basics of wireless communications.
- To make students understand basics of cellular communications.

**Course Outcome**

**After Completion of the course the student is able to**

- Analyze the techniques used for signal modulation and demodulation.
- Distinguish the need for PPM, PWM, Multiplexing.
- Understand the fundamental concepts of Cellular & Mobile communications

**UNIT I**

**Introduction**

Block diagram of Electrical communication system, Radio communication, Types of communications: Analog, pulse and digital.

**Analog Modulation**

Need for modulation, Types of Analog modulation, Amplitude Modulation, Angle Modulation: Frequency & Phase modulations. Generation and Demodulation techniques.Advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

**UNIT II**

**Pulse Modulations**

Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing, Asynchronous Multiplexing.

**UNIT III**

**Digital Communication**

Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison. Digital Modulation : ASK, FSK, PSK, DPSK, QPSK demodulation, offset and non-offset QPSK, coherent and incoherent reception, Modems.

**UNIT IV**

**Introduction to Wireless Networking**

Introduction, Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks.

**UNIT V**

**Cellular Mobile Radio Systems**

Introduction to Cellular Mobile System, concept of frequency reuse, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems. Cell splitting.

**Handoffs and Dropped Calls**

Handoff, dropped calls and cell splitting, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assisted handoff, Intersystem handoff, micro cells, vehicle locating methods, dropped call rates and their evaluation.

**TEXT BOOKS:**

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.

2. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002,PHI.

**REFERENCES:**

1. Wireless Communication and Networking – William Stallings, 2003, PHI.

2. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.

3. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2nd Ed. 2004.

| III Year B.Tech EEE - I Sem | L | T/P/D | C |
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## (5CS71) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

**Course Objectives**

- Implement Different object-oriented Concepts in Java.
- Develop the concepts of Multi-Threading and IO-Streams
- Construct GUI models.

**Course Outcomes**

**After Completion of the course the student is able to**

- Write Java programs using various programming constructs using java.
- Solve different mathematical problems using OOP Paradigm
- Design and analyze the solutions for Thread and I/O management Concepts.
- Implement the Applications involving GUI models and Events.

**UNIT I**

**Fundamentals of Object Oriented programming**

Object oriented paradigm - Basic concepts of Object Oriented Programming - Benefits of OOP - Applications of OOP

**Java Evolution:** Java Features - How Java differs from C and C++ - Java and Internet - Java and World Wide Web - Web Browsers - Hardware and Software Requirements - Java Environment. Overview of Java Language: Simple Java Program - Java Program Structure - Java Tokens- Java Statements - Implementing a Java Program - Java Virtual Machine - Constants - Variables - Data types - Scope of Variables-Symbolic Constants-Type Casting and type promotions – Operators, Operator Precedence and Associativity - Control Statements – break - continue- Arrays-Multi dimensional arrays, Wrapper Classes - Simple examples.

**UNIT II**

**Classes**

Classes and Objects - Constructors – methods - this keyword – garbage collection- finalize - Overloading methods and constructors - Access Control- Static members – nested and inner classes – command line arguments - variable length arguments.

**Inheritance:** Forms of inheritance – specialization, specification, construction, extension, limitation, combination, benefits and costs of inheritance. Super uses- final - polymorphism, method overriding - dynamic method dispatch –abstract classes – exploring String class.

**UNIT III**

**Packages and Interface**

Defining and accessing a package – understanding CLASSPATH – access protection importing packages – Interfaces - Defining and implementing an interface, Applying interfaces, Variables in interfaces and extended interfaces. Exploring java.lang and java.util packages.

Exception Handling-Fundamentals, usage of try, catch, multiple catch clauses, throw, throws and finally. Java Built in Exceptions and creating own exception subclasses.

**UNIT IV**

**Multithreaded Programming**

Java Thread life cycle model – Thread creation - Thread Exceptions - Thread Priority – Synchronization - Messaging - Runnable Interface - Interthread Communication - Deadlock - Suspending, Resuming and stopping threads.

**I/O Streams:** File – Streams – Advantages - The stream classes – Byte streams – Character streams.

**UNIT V**

**Applet Programming**

How Applets differ from Applications - Applet Life Cycle - Creating an Applet - Running the Applet- Designing a Webpage - Applet Tag - Adding Applet to HTML file - More about Applet Tag - Passing parameters to Applets - Aligning the display.

**Event handling:** basics of event handling, Event classes, Event Listeners, delegation event model, handling mouse and keyboard events, adapter classes, AWT Class hierarchy - AWT Controls - Layout Managers and Menus, limitations of AWT.

**TEXT BOOKS:**


1. The Complete Reference Java J2SE 5th Edition, Herbert Schildt, TMH Publishing Company Ltd, NewDelhi.
2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons


**REFERENCES:**


1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
3. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

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| **III Year B.Tech EEE - I Sem** | **L** | **T/P/D** | **C** |
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## (5EI71) PRINCIPLES OF MEASUREMENTS AND INSTRUMENTATION

**Course Objectives**

- To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems.
- To provide better familiarity with the concepts of Sensors and Measurements.
- To provide the knowledge of various measurement methods of physical parameters like velocity, acceleration, force, pressure and viscosity.

**Course Outcomes**

**After Completion of the course the student is able to**

- Able to identify suitable sensors and transducers for real time applications.
- Able to translate theoretical concepts into working models.
- Able to understand the basic of measuring device and use them in relevant situation.
- Able to estimate the errors in measurement by means of calibrating the different instruments against the standards.

**UNIT I**

Introduction to measurements.Physical measurement.Forms and methods of measurements.Measurement errors.Statistical analysis of measurement data.Probability of errors.Limiting errors. Standards.Definition of standard units.International standards.Primary standards.Secondary standards.Working standards.Voltage standard.Resistance standard.Current standard.Capacitance standard.Time and frequency standards.

**UNIT II**

**Passive Sensors**

**Resistive Sensors:** Potentiometers, Strain Gages, Resistive TemperatureDetectors (RTDs),Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers , **Capacitive Sensors:** Variable capacitor, Differential capacitor, **Inductive Sensors:** Reluctance variation sensors, Eddy current sensors

**UNIT III**

**METROLOGY**

Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge blocks.Optical Methods for length and distance measurements.

**VELOCITY AND ACCELERATION MEASUREMENT**

Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods.

Accelerometers- different types, Gyroscopes-applications.

**UNIT IV**

**Force and Pressure Measurement**

Gyroscopic Force Measurement – Vibrating wire Force transducer.

Basics of Pressure measurement –Manometer types – Force-Balance and Vibrating Cylinder Transducers – High and Low Pressure measurement

**Unit V**

**FLOW, Density and Viscosity Measurements**

Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, Density measurements – Strain Gauge load cell method – Buoyancy method.

Units of Viscosity, Two float viscorator –Industrial consistency meter

**TEXT BOOKS:**

1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997

**REFERENCES:**

1. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
2. Instrument Transducers – An Introduction to their Performance and design – by Herman K.P.Neubrat, Oxford University Press.
3. Measurement system: Applications and Design – by E.O.Doeblin, McGraw Hill Publications.
4. Electronic Instrumentation by H.S.Kalsi.

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| **III Year B.Tech EEE - I Sem** | **L** | **T/P/D** | **C** |
| **Open Elective I** | **3** | **0** | **3** |

## (5IT71) CYBER SECURITY

**Course Objectives:**

- **Identify** the key components of cyber security in network
- **Describe** risk management processes and practices
- **Define** types of service delivery process and storage management process
- **Access** additional external resources to supplement knowledge of cyber forensics and laws

**Course Outcomes:**

After completion of the course the student is able to

- **Categorization** of cyber-crime and an understanding social, political, ethical and psychological dimensions cyber security
- **Demonstrate** cyber offenses tools, methods used in cyber crime
- **Document** an appropriate procedure of Risk Management and Security Standards
- **Understanding** computer forensics and analyzing them

**UNIT-I**

**INTRODUCTION TO CYBER CRIME:** Introduction Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, E-mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/ Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/ Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usernet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, Hacking and the Indian Law(s), A Global Perspective on Cybercrimes, Cybercrime and the Extended Enterprise.

**UNIT-II**

**CYBER OFFENSES: HOW CRIMINALS PLAN THEM:** Introduction, Categories of Cybercrime, How Criminals Plan the Attacks, Reconnaissance, Passive Attacks, Active Attacks, Scamming and Scrutinizing Gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Classification of Social Engineering, Cyber stalking, Types of Stalkers, Cases Reported on Cyber stalking, How Stalking Works?, Real-Life Incident of Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The fuel for Cybercrime, Botnet, Attack Vector, Cloud Computing, Why Cloud Computing?, Types of Services, Cybercrime and Cloud Computing.

**UNIT-III**

**TOOLS AND METHODS USED IN CYBER CRIME:** Introduction, Proxy Servers and

Anonymizers, Phishing, How Phishing Works, Password Cracking, Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords, Keyloggers and Spywares, Software Keyloggers, Hardware Keyloggers, Antikeylogger, Spywares, Virus and Worms, Types of Viruses, Trojan Horses and Backdoors, Backdoor, How to Protect from Trojan and Backdoors, Steganography, Steganalysis, Dos and DDos Attacks, Dos Attacks, Classification of Dos Attacks, Types of Levels of Dos Attack, Tools Used to Launch Dos Attacks, DDos Attacks, How to protect from Dos/DDos Attacks, SQL Injection, Steps for SQL Injection Attack, How to Prevent SQL Injection Attacks.

**UNIT-IV**

**UNDERSTANDING COMPUTER FORENSICS:** Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, The Rules of Evidence, Forensics Analysis of E-Mail, RFC2822, Digital Forensics Life Cycle, The Digital Forensics Process, The Phases in Computer Forensics/Digital Forensics, Precautions to be Taken when Collecting Electronic Evidence, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Typical Elements Addressed in a Forensics Investigation Engagement Contract , Solving a Computer Forensics Case, Computer Forensics and Steganography, Rootkits, Information Hiding, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Technical Challenges: Understanding the Raw Data and its Structure, The Legal Challenges in Computer Forensics and Data Privacy Issues, Special Tools and Techniques, Digital Forensics Tools Ready Reckoner, Special Technique: Data Mining used in Cyber forensics, Forensics Auditing.

**UNIT-V**

**CYBERCRIME AND CYBERTERRORISM: SOCIAL, POLITICAL, ETHICAL and PSYCHOLOGICAL DIMENSIONS:** Introduction, Intellectual Property in the Cyberspace, Copyright, Patent, Trademarks, Trade Secret, Trade Name, Domain Name, The Ethical Dimension of Cybercrimes, Ethical Hackers: Good Guys in Bad Land, The Psychology, Mindset and Skills of Hackers and Other Cybercriminals, Inside the Minds and Shoes of Hackers and Cybercriminals, Hackers and Cybercriminals: Evolution of Technical prowess and Skills, Ethical Hackers, Sociology of Cybercriminals, Personality Traits of Cybercriminals and Younger Generation's views about Hacking, Information Warfare: Perception or An Eminent Reality?, Cyberwar Ground is HOT, Cyber Jihadist on the Rise.

**TEXT BOOKS:**

1. Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley.

**REFERENCES:**

1. Management of Information Security, M. E. Whitman, H. J. Mattord, Nelson Education, CENGAGE Learning, 2011, 3rd Edition.
2. Guide to Computer Forensics and Investigations, B. Nelson, A. Phillips, F. Enfinger, C. Steuart, Nelson Education / CENGAGE Learning, 2010, 4th Edition

**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY**

| **B.Tech. III Year EEE - I Semester** | **L** | **T/P/D** | **C** |
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| **Open Elective I** | **3** | **0** | **3** |

## (5AE71) PRINCIPLES OF AUTOMOBILE ENGINEERING

**Course objectives:**

- Understand the layout of an automobile and functionalities subsystems
- Provide overview on concepts of engine, cooling, lubrication and fuel systems
- Present constructional features and working of automotive driveline and running systems
- Study the fundamentals and principles of automotive electrical systems.

**Course Outcomes**

**After Completion of the course the student is able to**

- Explain the functionalities of automotive systems and subsystems
- Give an overview on engine and engine subsystems.
- Describe working of automotive driveline and running systems
- Discuss the concepts of automotive starting, ignition and charging systems

**UNIT I**

**Introduction**

Classification of automobiles, layout of an automobile, automobile sub systems and their role. Types of chassis, role and requirement of a chassis frame, types of frames, materials, loading points and types of bodies.

**UNIT II**

**Engine**

Classification and components of an engine, principle and working of four stoke and two stroke SI and CI engines. Carburetor, diesel fuel injection and introduction to electronic fuel injection system. Cooling - Necessity of cooling, air-cooling and water cooling. Lubrication – Mist, splash and forced system.

**UNIT III**

**Drive Line**

Clutches, principle, single plate clutch, multi plate clutch and centrifugal clutch.Gear box - Need, sliding mesh, constant mesh and synchromesh gear box.Propeller shaft, universal joint, differential, wheels and tyres.

**UNIT IV**

**Running Systems**

Suspension systems – Objective, rigid axle and independent suspension system and torsion bar.Steering system – Layout, steering mechanism, steering geometry and steering gearboxes. Brake system –Principle, stopping distance, types of brakes and actuation.

**UNIT V**

**Electrical Systems**

Starting system - Principle, working of different starter drive units and solenoid switches. Ignition system **-** Conventional ignition system types, ignition advance and retarding mechanisms. Charging system - Alternatorprinciple, construction and working, cut-outs and regulators.

**TEXT BOOKS:**


1. Heinz Heisler, “Advanced Vehicle Technology”. Butterworth Heinemann Publishers, 2002.
2. Crouse W H, “Automobile Electrical Equipment” , McGraw Hill Book Co., Inc., New York 3rd edition,1986.


**REFERENCES:**


1. Garrett T K, Newton K. and Steeds W. “Motor Vehicle”, Butter Worths & Co. Publishers Ltd., New Delhi, 2001.
2. Kholi P L, “Automotive Electrical Equipment”, Tata McGraw Hill Co., Ltd., New Delhi, 1975.
3. Crouse W H, "Automotive Chassis and Body," McG raw Hill Book Co., 5th edition, 1976.
4. Giri N K, Automotive Mechanics, Khanna Publications,2006.

**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY**

| **B.Tech. III Year EEE - I Semester** | **L** | **T/P/D** | **C** |
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| **Open Elective I** | **3** | **0** | **3** |

## (5BS71) PROFESSIONAL ETHICS AND HUMAN VALUES

**Introduction**

Human values and ethics have a significant role to play in the betterment of our society. Ethics and values are a liberating force, enabling higher performance, better quality relationships and an expanded sense of purpose and identity. This syllabus aims to present a framework for understanding human values and their role in life, work, business and leadership. It aims to transform individuals from having self-focused, survivalist mindset that has scant regard for ethics, through to compliance with laws and conventions, and then to the aspiration to live a higher ethical and spiritual life. It mainly focuses on improving the capacities of leadership /management through training in human values and professional ethics. It serves to contribute to good governance in the organizations and foster an environment that supports and encourages just practices and fair play.

**Course objectives:**

- **Create** an awareness on Engineering Ethics and Human Values
- **Study** the moral issues and decisions confronting individuals and organizations engaged in engineering profession
- **Study** the related issues about the moral ideals, character, policies, and relationships of people and corporations involved in technological activity

**Course Outcomes:**

After completion of the course the student is able to:

- **Learn** the moral issues and problems in engineering; find the solution to those problems
- **Learn** the need for professional ethics, codes of ethics and roles, concept of safety, risk assessment
- **Gain** exposure to Environment Ethics & computer ethics; know their responsibilities and rights

**UNIT I**

**Introduction to Human Values and Ethics Human Values:** Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing –Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

**Introduction to Ethical Concepts:** Definition of industrial ethics and values, Ethical rules of industrial worker- Values and Value Judgments -- Moral Rights and Moral rules 121 -- Moral character and responsibilities -- Privacy, confidentiality, Intellectual property and the law -- Ethics as law.

**UNIT II**

**Understanding Engineering Ethics:** Action Oriented- Ethical Vision- Indian Ethos- Ethics Defined-Engineering Ethics: Various Connotations of Engineering Ethics, Why Study Engineering Ethics?, Personal and Business Ethics-Ethics and the Law-Senses of 'Engineering Ethics' – Variety of moral issues –Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory –Gilligan's theory – Consensus and Controversy – Professions and Professionalism –Professional Ideals and Virtues – Theories about right action – Selfinterest –Customs and Religion – Uses of Ethical Theories -Engineering as a Profession -- Professional Societies -- Core Qualities of Professional Practitioners -- Professional Institutions, Operating in a Pluralistic Society - Environments and Their Impact - Economic Environment -- Capital Labor-- Price Levels -- Government Fiscal and Tax Policies – Customers – Technology.

**UNIT III**

**Engineering as Social Experimentation**– Comparison with Standard Experiments, Knowledge Gained Conscientiousness, Relevant Information, Learning from the Past, Engineers as managers, consultants, and Leaders, Accountability, Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law. Engineers and Managers -- Organizational complaint procedures - Government agencies Resolving Employee concerns – Limits on acceptable behavior in large corporations -- Ethical and legal considerations, Organizational responses to offensive behaviour and harassment.

**UNIT IV**

**Workplace Rights and Responsibilities Professional Responsibility:** The basis and scope of Professional Responsibility -- Professions and Norms of Professional Conduct -- Ethical Standards versus Profession -- Culpable mistakes -- the Autonomy of professions and codes of ethics - - Employee status and Professionalism -- Central Professional Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, Hazards and Risks. Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and reducing risk - Ethical standards vs. Professional conduct - Collegiality and Loyalty – Respect for Authority – Collective Bargaining –Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights –Employee Rights – Intellectual Property Rights (IPR) – Discrimination - Organizational complaint procedures - Government agencies - Resolving Employee concerns.

**UNIT V**

**Ethics in Global Context and Global Issues:** Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers (IETE), India, etc.122.

**TEXT BOOKS:**


1. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw Hill. New York 1996.
2. Ethics in Engineering Practice and Research, Caroline Whitbeck, Elsevier.
3. Engineering Ethics, Govindarajan. M, Natarajan. S, Senthilkumar. V.S, Prentice Hall of India, 2004.

**REFERENCES:**


1. Engineering Ethics, Charles D Fleddermann, Prentice Hall, New Jersey, 2004 (Indian Reprint).
2. Engineering Ethics Concepts and Cases, Charles E Harris, Michael S Pritchard and Michael J Rabins, Thompson Learning, United States, 2000 (Indian Reprint now available).
3. Ethics and the Conduct of Business, John R Boatright, Pearson Education, New Delhi, 2003.
4. Fundamentals of Ethics for Scientists and Engineers, Edmund G Seebauer and Robert L Barry, Oxford University Press, Oxford, 2001.
5. Ethics in Engineering, Fourth Edition, Mike W. Martin, Rolan Schinzinger, Mc Graw Hill publishers.
6. Engineering Ethics-An industrial Perspective, Gail Dawn Baura.
7. Ethics and Values in Industrial-Organizational Psychology, Joel Lefkowitz.

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**III Year B.Tech EEE – I sem** **L T/P/D C**

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**(5EE53) ELECTRICAL MACHINES- II LABORATORY**

**Course Prerequisites**: Electrical Machines – I, II & III

**Course Objectives:**

- To understand the operation of synchronous machines
- To know different methods of finding voltage regulation of synchronous generators
- To understand different testing methods to assess electrical machines
- To learn how to convert phase between 3 to 2 and vice-versa

**Course Outcomes:**

After completion of this course the student is able to

Upon the completion of this laboratory course, the student will be able

- Assess the performance of different machines using different testing methods
- Convert the phase from 3 phase to 2 phase and vice-versa
- Compensate the changes in terminal voltages of synchronous generator after estimating the change by different methods
- Control the active and reactive power flows in synchronous machines
- Start different machines and control the speed and power factor

**Part – A**

1. Sumpner's test on two identical single-phase transformers
2. Separation of iron losses of a single-phase transformer
3. Scott-connected Transformer
4. No-Load and blocked rotor tests on three-phase squirrel-cage Induction Motor
5. Brake test on three phase squirrel cage induction motor
6. Regulation of three-phase Alternator by synchronous impedance method.
7. Regulation of three-phase Alternator by ZPF Method
8. Slip test on three-phase salient pole Alternator
9. **V** and inverted **V** curves of a three-phase synchronous motor
10. speed control of three-phase slip ring Induction Motor

**Part - B**

11. Regulation of three-phase Alternator by MMF Method
12. Regulation of three-phase Alternator by ASA method
13. Power angle curve and efficiency of three-phase synchronous machine
14. Parallel operation of three-phase Alternator with grid
15. Equivalent circuit and Brake test on Single-phase Induction Motor
16. Sequence impedances of synchronous machines
17. Power factor improvement of three-phase squirrel cage Induction Motor
18. Vector group test and parallel operation of three-phase transformer

Minimum of Ten experiments (Eight from PART-A and Two from PART-B) need to be conducted

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| **III Year B.Tech EEE – I sem** | **L** | **T/P/D** | **C** |
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**(5EE54) CONTROL SYSTEMS AND SIMULATION LABORATORY**

**Course Prerequisites**: Control Systems

**Course objectives:**

- To understand the different ways of system representations such as Transfer function representation and state space representations
- To get the transfer functions of various physical and laboratory based systems.
- To design various controllers and compensators to improve system performance and test them in the laboratory
- To get the performance of various devices (Magnetic amplifiers, Servo motors and stepper motors etc.)

**Course Outcomes:**

After completion of this course the student is able to

- Solve electrical engineering problems using suitable software
- Design various controllers and compensators to improve system performance and test them in the laboratory
- Choose various devices (Magnetic amplifiers, Servo motors and stepper motors etc.) for different applications in Electrical Systems
- Design the state space model of DC motor.

**Part - A**

1. Time response of Second order system using suitable software
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions
4. Effect of feedback on DC servo motor.
5. Transfer function of DC motor
6. Effect of P, PD, PI, PID Controller on a second order systems.
7. Lag and lead compensation – Magnitude and phase plot.
8. Transfer function of DC generator
9. Temperature controller using PID Controller
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Stepper Motor characteristics
13. Study of open loop and closed loop configurations of Control Systems

**Part - B**

14. (a) MATLAB Simulation of P, PI, PID Controller.

    (b) Linear system analysis (Time domain analysis, Error analysis) using suitable software

15 Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software

16. State space model for classical transfer function using suitable software - Verification.

17. Design of Lead-Lag compensator for the given system and with specification using suitable software

**Minimum of Ten experiments (Eight from PART-A and Two from PART-B) need to be conducted**

**REFERENCES:**

MATLAB and its Tool Box user's manual and – Mathworks, USA

Modern Control Engineering by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998

Simulation of Electrical and electronics Circuits using PSPICE by M.H.Rashid, M/s PHI Publications

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| **III Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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## (5EE55)POWER ELECTRONICS AND SIMULATION LABORATORY

**Course Prerequisites:** Power Electronics

**Course Objectives**

The student should be able to

- Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
- Design the power converter with suitable switches meeting a specific load requirement.

**Course Outcomes**

After completion of this course the student is able to

- Understand the operating principles of various power electronic converters.
- Use power electronic simulation packages& hardware to develop the power converters.
- Analyze and choose the appropriate converters for various applications.

**PART A**

1. Study of Characteristics of SCR, MOSFET & IGBT
2. Study of UJT gate firing circuit for SCR
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5 Single Phase Cyclo-converter with R and RL loads
6. Single Phase half controlled converter with R load
7. Three Phase half controlled bridge converter with R-load
8. Single Phase Bridge inverter with R and RL loads
9. Study of buck converter
10. Study of boost converter

**PART B**

1. (a)Simulation of single-phase Half wave converter using R and RL loads
   (b)Simulation of single-phase full converter using R, RL and RLE loads
   (c)Simulation of single-phase Semi converter using R, RL and RLE loads
2. (a)Simulation of Single-phase AC voltage controller using R and RL loads
   (b)Simulation of Single phase Cyclo-converter with R and RL-loads
3. Simulation of Buck chopper
4. Simulation of single phase Inverter with PWM control

5. Simulation of three phase fully controlled converter with R and RL loads, with and without freewheeling diode. Observation of waveforms for Continuous and Discontinuous modes of operation.
6. Study of PWM techniques

**Minimum of Ten experiments (Eight from PART-A and Two from PART-B) need to be conducted**

**REFERENCES:**


1. Simulation of Electric and Electronic circuits using PSPICE – by M.H.Rashid, M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Box user's manual and – Mathworks, USA.

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**III Year B.Tech EEE – II Sem** **L T/P/D C**

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## (5EE11) POWER SEMICONDUCTOR DRIVES

**Course Prerequisites**: Power Electronics, Electrical Machines – I, II & III

**Course Objectives**

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed –torque characteristics of different motor drives by various power converter topologies
- To Understand the motoring and braking operations of drive
- To Understand the differences between DC drives and AC drives

**Course Outcomes:**

After completion of this course the student is able to

- Identify the drawbacks of speed control of motor by conventional methods.
- Understand Phase controlled and chopper controlled DC drives speed-torque characteristics merits and demerits
- Understand Ac motor drive speed–torque characteristics using different control strategies its merits and demerits
- Describe Slip power recovery schemes

**UNIT – I**

**CONTROL OF DC MOTORS BY SINGLE PHASE AND THREE PHASE CONVERTERS**

Introduction to Thyristor controlled Drives, Single Phase,3-phase semi and Fully controlled converters connected to d.c separately excited and d.c series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed d.c motors.

**UNIT – II**

**FOUR QUADRANT OPERATION OF DC DRIVES**

Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic and Regenerative Braking operations. Four quadrant operation of D.C motors by single phase and three phase dual converters – Closed loop operation of DC motor (Block Diagram Only)

**CONTROL OF DC MOTORS BY CHOPPERS**

Single quadrant, Two quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation ( Block Diagram Only)

**UNIT-III**

**CONTROL OF INDUCTION MOTOR THROUGH STATOR VOLTAGE AND STATOR FREQUENCY**

Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics.

Variable frequency characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only)

**UNIT – IV**

**ROTOR SIDE CONTROL OF INDUCTION MOTOR**

Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages, applications, problems.

**UNIT –V**

**CONTROL OF SYNCHRONOUS MOTORS**

Separate control and self control of synchronous motors – Operation of self controlled synchronous motors by VSI, CSI and cycloconverters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control - Cyclo converter, PWM based VSI& CSI.

**TEXT BOOKS:**


1. Fundamentals of Electric Drives by G K Dubey, Narosa Publications.
2. Electric motor drives - modeling, Analysis and control by R.Krishnan, Prentice Hall PTR, 2001
3. Modern Power Electronics and AC Drives by B.K.Bose, PHI.
4. Thyristor Control of Electric drives by Vedam Subramanyam, Tata McGraw Hill Publications.


**REFERENCES:**


1. A First course on Electrical Drives – S K Pillai New Age International (P) Ltd. 2nd Edition.
2. Thyristor DC Drives by P.C.Sen,Wiley-Blackwell, 1981

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| **III Year B.Tech EEE – II sem** | **L** | **T/P/D** | **C** |
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## (5EE12) POWER SYSTEM ANALYSIS

**Course Prerequisites**: Power Systems-II, Numerical analysis and Graph Theory, Circuit Theory, Electrical Machines – III

**Course Objectives:**

- To describe load flow methods
- To analyze symmetrical and unsymmetrical faults
- To describe stability types
- To learn different methods of stability analysis.

**Course Outcomes**
After completion of this course the student is able to

- Solve Load flow problems
- Apply symmetrical components for symmetrical and unsymmetrical fault analysis Analyze the different load flow methods
- Analyze the swing equation and stability
- Analyze different types of stability.

**UNIT-I**

**POWER SYSTEM NETWORK MATRICES**

Graph Theory: Basic Concepts-Branch, Link, bus Incidence Matrix, Formation of Bus Admittance Matrix using direct inspection and singular transformation method-Numerical Problems. Formation of $Z_{Bus}$: Partial network, Algorithm for Modification of $Z_{Bus}$ Matrix for addition of an element for the following cases- Addition of an element as a link, Addition of an element as a tree branch, Derivations and Numerical Problems.

**UNIT –II**

**POWER FLOW STUDIES**

Introduction, Classification of buses, Formulation of static load flow equations, Solution techniques using Gauss Seidel Method- Algorithm and Flowchart. Numerical problems Load flow Solution for Simple Power Systems- Determination of Bus quantities, finding Line Flows/Losses for the given Bus Voltages (Computation upto two iterations only and limited to 3 bus power system networks). Newton Raphson Method in Rectangular and Polar Co-ordinates Form- Load Flow Solution -Algorithm and Flowchart, Numerical Problems.
Principles of Decoupled and Fast Decoupled Methods- Comparison of Different Methods.

**UNIT – III**

**SHORT CIRCUIT ANALYSIS**

Per-Unit System of Representation. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems.

Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Reactors-Numerical Problems.

Symmetrical Component Theory: Symmetrical Component Transformation, Sequence Networks: Positive, Negative and Zero sequence Networks for transformers, transmission line and synchronous machine, Numerical Problems.

Unsymmetrical Fault Analysis: LG, LL, LLG faults, Interconnection of sequence networks, effect of fault impedance, Numerical Problems.

**UNIT –IV**

**STABILITY ANALYSIS I**

Introduction, Concepts of small and large disturbance, Stability: Concept of steady state, Dynamic and Transient Stability. Steady State Stability Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve, Determination of Steady State Stability limit and Methods to improve steady state stability, Numerical problems.

**UNIT –V**

**STABILITY ANALYSIS II**

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation, Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers, Numerical analysis.

**TEXT BOOKS:**


1. Elements of Power System by Stevenson, Tata McGraw Hill
2. Computer Techniques in Power System Analysis by M.A.Pai, TMH Publications.
3. Modern Power system Analysis by I.J.Nagrath and D.P.Kothari: Tata McGraw-Hill Publishing Company, 2nd edition.


**REFERENCES:**


1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Power System Analysis by A.R.Bergen, Prentice Hall, Inc.
3. Power System Analysis by Hadi Saadat, TMH Edition.
4. Power System Analysis by B.R.Gupta, Wheeler Publications.

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## (5EI06) LINEAR AND DIGITAL IC APPLICATIONS
## (Common for EEE, ECE& EIE)

**Pre-requisites:** Electronic circuits and Digital fundamentals

**Course Objectives**

- To study the characteristics and design concepts of operational amplifiers.
- To understand the functionality of specific ICs: 555 timer, 565, voltageregulators.
- To study the applications and design concepts of various ICs.
- To understand concepts of Digital circuits and design circuits using digital ICs.

**Course Outcomes**

After completion of this course the student is able to

- Analyze the characteristics of analog ICs and logic families.
- Design applications using analog ICs.
- Design applications using digital ICs

**UNIT – I:**

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

**OP-AMP APPLICATIONS :** Basic application of Op-amp, Instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample and Hold circuits, Log and antilog amplifier, Precision rectifiers, Differentiators, Integrators, Peak detector, Comparators.

**UNIT – II:**

**ACTIVE FILTERS and OSCILLATORS:** Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters. Oscillator types and principle of operation – RC and Wien bridge, waveform generators – triangular, square wave and VCO.

**UNIT – III:**

**SPECIAL ICs:** Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL-Introduction, block schematic, principles and description of individual blocks of 565, introduction to voltage regulators.

**D-A AND A- D CONVERTERS :** Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs -

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

**UNIT – IV:**

**LOGIC FAMILIES :** Classification of Integrated circuits, comparison of TTL and CMOS logic families, standard TTL NAND Gate- Analysis and characteristics, TTL open collector O/Ps, Tristate TTL, MOS and CMOS open drain and tristate outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS and CMOS driving TTL .

**UNIT – V:**

**Applications of TTL 74XX Series:**

**COMBINATIONAL CIRCUITS :**Code Converters, Decoders, De-multiplexers, Encoders, priority Encoders, multiplexers and their applications, Priority Generators. Arithmetic circuit ICs-parallel binary Adder/Subtractor circuits using 2's-Complement system. Digital comparator circuits.

**SEQUENTIAL CIRCUITS** : RS, JK, JK Master Slave, D and T Type Flip-Flops. Synchronous and Asynchronous counters, Decade counter, shift registers

**TEXT BOOKS:**


1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2008..
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.
3. Op-Amps and Linear ICs – Ramakanth A. Gayakwad, PHI, 1987


**REFERENCES:**


1. Operational Amplifiers and Linear Integrated Circuits – R.F. Coughlin and Fredrick F. Driscoll, PHI, 1977.
2. Operational Amplifiers and Linear Integrated Circuits:4/e William D Stanley PEI 2009.
3. Op Amps and Linear Integrated Circuits: Concepts and Applications by James M.Fiore, Cengage/ Jaico ,2/e, 2009.
4. Operational Amplifiers and Linear Integrated Circuits by K.Lal Kishore - Pearson education, 2008.
5. Modern Digital Electronics RP Jain 4/e TMH 2010.

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| **III Year B.Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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## (5EC09) MICROPROCESSORS AND MICROCONTROLLERS
## (Common for EEE, ECE& EIE)

**Course Prerequisites**: Digital fundamentals, Computer Organization

**Course Objectives**

- To understand characteristics and architectures of various microprocessors and microcontrollers.
- Understand basic programming concepts and software tools
- Learn various interfacing circuits necessary for various applications
- To learn various interfacing concepts.

**Course Outcomes**

After completion of this course the student is able to

- Understand the architecture of microprocessor/ microcontroller and their operation
- Demonstrate programming skills in assembly language for processors and Controllers
- Analyze various interfacing techniques and apply them for the design of processor/ controller based systems

**UNIT I**

Introduction to 8085 Microprocessor, Architecture of 8086 Microprocessor, Addressing modes of 8086, Instruction set of 8086, Assembler directives, simple assembly language programs, procedures, and macros. Pin diagram of 8086-Minimum mode and maximum mode of operation.

**UNIT II**

Memory and I/O organization of 8086, 8255 PPI – various modes of operation and interfacing to 8086, D/A and A/D converter to 8086 using 8255, memory interfacing to 8086.

**UNIT III**

Serial Communication standards, serial data transfer schemes, 8251 USART architecture and interfacing, RS-232, IEEE 488 standards. Interrupt structure of 8086, Interrupt Vector Table. Need for 8259 Programmable Interrupt Controller.

**UNIT IV**

Introduction to Microcontrollers, 8051 Microcontroller Architecture, I/O ports, memory organization, counters and Timers, Serial data Input/Output, Interrupts. Addressing modes, Instruction set of 8051, Simple programs.

**Timer, serial port and Interrupts programming:** Programming 8051 timers/counters, 8051 serial port programming, programming timer interrupts, programming External hardware interrupts, programming serial communication interrupts.

**UNIT V**

**Interfacing to 8051**: A/D and D/A Converter, Stepper Motor Interface, Key Board Interfacing, LCD Interfacing.

**ARM Processor**:Fundamentals, Registers, current program status register, pipeline, Exceptions, Interrupt and the vector table.

**TEXT BOOKS:**


1. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
2. The 8051 microcontrollers and Embedded systems- Mazidi and mazidi, PHI, 2000.


**REFERENCES:**


1. ARM System Developer's Guide: Designing and Optimizing System Software- Andrew N. Sloss, Dominic Symes, Chris Wright, Elsevier Inc., 2007
2. Micro computer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd edition.
3. Advanced microprocessors and Peripherals – A.K.Ray and K.M.Bhurchandi, TMH, 2000.
4. Microcontrollers and Applications, Ajay . V. Deshmukh, TMGH,2005.
5. The 8085 Microprocessor : Architecture Programming and Interfacing – K.Uday Kumar, B.S Umashankar, Pearson , 2008.

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## (5CE72) INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEM

**Course Objectives**

**Student shall be able**

- To **describe** and **define** various concepts of Remote Sensing and GIS.
- To enable the students to **analyze** data using GIS.
- To make the students **appraise** the importance of accuracy in GIS.
- To enable the students to **apply** GIS knowledge in solving various problems in real world scenario.

**Course Outcomes**

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

- **describe** different concepts and terms used in GIS
- **compare** and process different data sets
- **evaluate** the accuracy and **decide** whether a data set can be used or not.
- **demonstrate** various applications GIS.

**UNIT- I:**

**Introduction to GIS:** Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing,

**UNIT- II:**

**Spatial Database Management System:** Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization

**Data models and data structures:** Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

**UNIT- III:**

**Spatial Data input and Editing:** Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

**Spatial Analysis:** Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

**UNIT- IV: Implementing a GIS and Advanced GIS**

**Implementing a GIS:** Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS

**Advanced GIS:** WebGIS concept**,** webGIS fundamentals,Potential of web GIS, Server side strategies, client side strategies, mixed strategies, webGIS applications

**UNIT- V:**

**Applications of GIS**

GIS based road network planning, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications, Mineral mapping using GIS.

**TEXT BOOKS**

1. Introduction to Geographic Information systems by Kang-tsung Chang, McGrawHill Education (Indian Edition), 7th Edition, 2015.
2. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

**REFERENCES**

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Revised Edition, 2011.
2. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy, B.S.Publications, 4th Edition, 2012.
3. Textbook of Remote Sensing and Geographical Information systems by Kali Charan Sahu, Atlantic Publishers and Distributors, 1st Edition, 2007.
4. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.

| III Year B.Tech EEE - II Sem | L | T/P/D | C |
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## (5EE72) ENERGY AUDITING CONSERVATION AND MANAGEMENT

**Course Objectives**

- To understand the necessity of conservation of Energy.
- To Know the methods of Energy management .
- To identity the factors to increase the efficiency of electrical equipment.
- To know the benefits of carrying out energy Audits.

**Course Outcomes:**

**After Completion of the course the student is able to**

- To conduct Energy Audit of industries.
- To manage energy Systems
- To specify the methods of improving efficiency of electric motor.
- To improve power factor and to design a good illumination system
- To calculate pay back periods for energy saving equipment.

**Unit I Basic principles of Energy audit**

Energy audit- definitions, concept , types of audit, energy index, cost index ,pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit

**Unit II Energy management**

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manager, Qualities and functions, language, Questionnaire - check list for top management

**Unit III Energy efficient Motors**

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed, variable duty cycle systems, RMS hp- voltage variation- voltage unbalance- over motoring- motor energy audit

**Unit IV Power Factor Improvement, Lighting and energy instruments**

Power factor – methods of improvement, location of capacitors, p.f with non-linear loads, effect of harmonics on p.f. , p.f motor controllers - Good lighting system design and practice, lighting control, lighting energy audit - Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, flux meters, tongue testers ,application of PLC's

**Unit V Economic aspects and analysis**

**Economics Analysis-**Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis- Energy efficient motors-calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

**TEXT BOOKS**


1. Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann publications.

2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998


**REFERENCES:**


1. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-

2. Energy management handbook by W.C.Turner, John wiley and sons

3. Energy management and good lighting practice: fuel efficiency- booklet12-EEO

| III Year B.Tech EEE - II Sem | L | T/P/D | C |
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| Open Elective II | 3 | 0 | 3 |

## (5ME72) OPTIMIZATION TECHNIQUES

**Course Prerequisites:** Mathematics, Operation Research

**Course Objectives:**

- To understand the classification of optimization techniques and its practical use.
- To understand about the optimization of one dimensional optimization methods.
- To knows about constrained minimization methods.
- To understands Geometric and dynamic programings.

**Course Outcomes:**

After completion of the course the student is able to:

- Apply the different types of optimization techniques for different purposes.
- Formulates and solve the problems by using one dimensional unconstrained minimization methods.
- Formulates and solve the problems (industrial/research) by using the geometric programming.
- Formulate and solve the industrial problems by using the dynamic programming methods.

**UNIT I**

Introduction: Engineering Applications; Statement of the Optimal Problem: Classification; Optimization Techniques. Classical Methods: Single Variable Optimization; Multivariable Optimization without any Constraints with Equality and Inequality Constraints.

**UNIT II**

One-Dimensional Minimization Methods: Uni-model Function; Elimination Methods – Dichotomous Search, Fibonacce and Golden Section Methods; Interpolation Methods – Quadratic and Cubic Interpolation Methods.

**UNIT III**

Unconstrained Minimization Methods: Univariate, Conjugate Directions, Gradient and Variable Metric Methods. Constrained Minimization Methods: Characteristics of a constrained problem; Direct Methods of feasible directions; Indirect Methods of interior and exterior penalty functions.

**UNIT IV**

Geometric Programming: Formulation and Solutions of Unconstrained and Constrained geometric programming problems.

**UNIT V**

Dynamic Programming: Concept of Sub-optimization and the principle of optimality; Calculus, Tabular and Computational Methods in Dynamic Programming; An Introduction to Continuous Dynamic Programming.

**TEXT BOOKS:**


1. Optimization (Theory & Applications) – S.S. Rao, Wiley Eastern Ltd., New Delhi.

2. Optimization Concepts and Applications in Engineering - Ashok D.Belegundu and Tirupathi R Chandrupatla -- Pearson Education.


**REFERENCES:**


1. Optimization: Theory and Practice, C.S.G. Beveridge and R.S. Schechter, MGH, New York.

2. Genetic Algorithms in search, Optimization and Machine, Goldberg D. E., Addison-Wesley-NewYork.

3. Optimization for Engineering Design Algorithms and Examples, Kalyanamoy Deb, Prentice Hall of India.

| III Year B.Tech EEE - II Sem | L | T/P/D | C |
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| Open Elective II | 3 | 0 | 3 |

## (5EC72) INTRODUCTION TO MICRO PROCESSORS AND CONTROLLERS

**Course Objectives:**

- Differentiate various number systems
- Develop simple application using 8085 microprocessors
- Develop simple applications using 8051 microcontrollers

**Course outcomes:**

**After Completion of the course the student is able to**

- Understand basic computing concepts
- Know architecture of 8085 micro processors and 8051 Microcontrollers
- Interface peripherals to microprocessor
- Program internal resources of 8051 microcontroller

**UNIT I**

**Introduction to Computing**

Numbering and Coding Systems: Binary, Decimal, Hexadecimal and conversions, Binary and Hexadecimal Arithmetic, Complements, Alphanumeric codes. Digital Premier, Inside the Computer

**UNIT II**

**8085 Microprocessor**

Features, Architecture and operation of 8085, Programming Model, External Memory for 8085

**UNIT III**

**Programmable Peripheral Devices**

Programmable Peripheral Interface (8255), USART (8251), Programmable Interval Timer (8253) and interfacing.

**UNIT IV**

**8051 Microcontrollers**

Microcontrollers and Embedded Processors, Overview of the 8051 family, Architecture and Programming Model of 8051, Timers and Counters, parallel and serial ports, Interrupts, Special Function Register formats, Internal Memory Organization

**UNIT V**

**Applications**

8051 Programming in C: Data types for the 8051, programs for IO operations, programs on Timer operations, Serial IO ports, and interrupts, Case Study: DC Motor Control

**TEXT BOOKS**

1. Microprocessor Architecture, Programming and Applications with the 8085/8080A, Gaonkar
2. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, 2nd Edition, Muhammad Ali Mazidi,Janice Gillispie Mazidi, Rolin D. McKinlay

**REFERENCES**

1. The 8051 Microcontroller : programming, architecture by Ayala & Gadre, Cengage Publications
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.

| III Year B.Tech II Sem | L | T/P/D | C |
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## (5EC95) WIRELESS COMMUNICATIONS AND NETWORKS

**Prerequisite:** Computer Networks

**Course Objectives:**

- Understand fundamentals of wireless communications
- Know basics of wireless networks
- Differentiate fixed IP and Mobile IP
- Learn design of basic wireless LAN network

**Course outcomes:**

After Completion of the course the student is able to

- Understand the fundamental concepts of Cellular communications
- Differentiate various multiple access techniques
- Learn wireless protocols used in wireless Networks
- Understand mobile IP requirements

**UNIT I**

**WIRELESS COMMUNICATIONS & SYSTEM FUNDAMENTALS:**

Introduction to wireless communications systems, examples, comparisons & trends. Cellular concepts-frequency reuse, strategies, interference & system capacity, trunking and grade of service, improving coverage &capacity in cellular systems.

**UNIT II**

**MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION:**

FDMA, TDMA, SSMA (FHMA/CDMA/Hybrid techniques), SDMA technique (AS applicable to wireless communications). Packet radio access-protocols, CSMA protocols ,reservation protocols ,capture effect in packet radio , capacity of cellular systems .

**UNIT III**

**WIRELESS NETWORKING:**

Introduction, differences in wireless & fixed telephone networks, traffic routing in wireless networks –circuit switching, packet switching X.25 protocol. Wireless data services – cellular digital packet data (CDPD), advanced radio data information systems, RAM mobile data (RMD). Common channel signaling (CCS), ISDN-Broad band ISDN & ATM, Signalling System no .7(SS7)-protocols, network services part, user part, signaling traffic, services and performance.

**UNIT IV**

**MOBILE IP AND WIRELESS APPLICATION PROTOCOL:**

**Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling, WAP Architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, Wireless datagram protocol.**

**UNIT V**

**WIRELESS LAN TECHNOLOGY:**

**Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE 802 protocol Architecture, IEEE802 architecture and services, 802.11 medium access control, 802.11 physical layer.**

**BLUE TOOTH: Overview, Radio specification, Base band specification, Links manager Specification, Logical link control and adaptation protocol. Introduction to WLL Technology.**

**TEXTBOOKS:**

**1. Wireless Communication and Networking – William Stallings, PHI, 2003.**

**2. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn.,2002.**

**3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy,Pearson Education, 2002.**

**REFERENCES:**

**1. Wireless Digital Communications – Kamilo Feher, PHI, 1999Page 26 of 38**

| III Year B.Tech EEE - II Sem | L | T/P/D | C |
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| Open Elective II | 3 | 0 | 3 |

## (5CS72)Open Source Technologies

**Course Objectives**

- Understand Perl, Python, PHP and Ruby to new situations and learn from the experience.
- Assist Perl programmer or database administrator to compile large programming set.
- Incorporate PHP into HTML files, Write basic PHP scripts, Process form input, Write and use functions.
- Apply advanced techniques, tools, and methodologies that can be used to build complex, scalable, PHP applications.

**Course Outcomes**
**After Completion of the course the student is able to**

- Apply regular expressions to tokenize and validate data in a variety of languages
- Utilize Ruby to solve a wide range of text processing problems
- Understand the nuances and differences in a web based environment as compared to more traditional environments
- Distinguish variety of languages to develop interactive web applications

**UNIT I**
**Introduction to PERL**
Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines, advance Perl - finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

**UNIT II**
**PHP Basics**
PHP Basics- Features Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures . Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

**UNIT III**
**Advanced PHP Programming**
PHP and Web Forms, Files, PHI3 Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHI3, Sending Email using PHP, PHI3Encryption Functions, the Merypt package, Building Web sites for the World - Translating Websites- Updating Web sites Scripts, Creating the

Localization Repository, Translating Files, text. Generate Binary Files, Set the desired language within your scripts. Localizing Dates, Numbers and Times.

**UNIT IV**

**Python**

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

**UNIT V**

**Ruby**

Basics of Ruby, classes, objects and variable, arrays, Exception Handling ,threads, Regular Expressions, Strings, Objects in Ruby

**TEXT BOOKS:**

1. Programming Perl Larry Wall, T.Christiansen and J.Orwant, O'Reiily,SPD.
2. Guide to Programming with Python, M.Dawson, Cengage Learning.
3. The Ruby Programming Language 1st Edition by David Flanagan
4. **Professional PHP Programming** by Jesus M. Castagnetto , Harish Rawat , Deepak T. Veliath (WROX publication)

**REFERENCES:**

1. Perl Power, J.P.Flynt, Cengage Learning.
2. Perl by Example, E, Quigley, Pearson Education.
3. Programming Ruby: The Pragmatic Programmer's Guide, by Pragmatic Dave Thomas, Andy Thomas
4. Professional PHP6 by WROX publication

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| **III Year B.Tech EEE - II Sem** | **L** | **T/P/D** | **C** |
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**(5EI72) LABVIEW PROGRAMMING**

**Course Objective**

- Understand the new concept in measurement and automation.
- Understand how to control an external measuring device by interfacing a computer.
- Competent in data acquisition and instrument control.
- program for networking and other applications like Digital image processing control system and signal processing.

**Course Outcome**

**After Completion of the course the student is able to**

- Develop a Virtual Instrument using LabVIEW to communicate with real world.
- Identify salient traits of a virtual instrument and incorporate these traits in their projects.
- Experiment, analyze and document in the laboratory prototype measurement
- Develop program for application like networking, Digital image processing ,control system, etc

**UNIT I**

**Virtual Instrumentation**

Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Active X Programming.

**UNIT II**

**Structures and sequence**

Controlling program execution with structures: While and For loops, Shift registers, Case and Sequence structure and Sub VI

**Unit III**

**Composite Data and Displays**

Arrays and Structures: Two dimension array, Auto Indexing to set the for loop count, Building arrays with auto indexing, Array Acrobats, Polymorphism, Cluster Order, Cluster to pass data, Bundling and unbundling cluster, Interchangeable arrays and cluster , Error Cluster and Error handling functions:

Chart update modes, Single Plot chart, Wiring multiple plot chart, Single Plot verus Multiple plot data types, The X scroll bar, clearing the chart, Stacked and overlaid plots, Multiple Y scales and chart history lengths.: Activity: Temperature monitor, Graphing a sine wave, XY plot to plot a circle, Temperature analysis and 3D graphs.

**Unit IV**

**Strings, File output and Signal Measurements and generation**

Single line strings, online string updation, Scroll bar, Writing and reading a measurement file,Writing and reading from a spread sheet,Computer to real world interface using LabVIEW, Creating Ni DAQ Task in Measurement and Automation Explorer (MAX), Generating code from MAX, DAQ timing and trigger, Multichannel and continuous acquisition, Streaming Data file and Counting frequency and events.VI Chassis requirements. Common Instrument Interfaces: Currentloop, RS 232C/ RS485,GPIB.

**Unit V**

**Applications**

Networking basics for office & Industrial applications, VISA and IVI, VI toolsets, Distributed I/O modules, Development of Control system, Industrial Communication,Image acquisition and processing

**TEXT BOOKS:**

1. Gary Johnson, LabVIEW Graphical Programming, 2nd edition,McGraw Hill, Newyork, 1997.
2. Lisa K. wells & Jeffrey Travis, LabVIEW for everyone, Prentice Hall, New Jersey, 1997.

**REFERENCES:**

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes,2000.

| III Year B.Tech II Sem | L | T/P/D | C |
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## (5EI79) FUNDAMENTALS OF ROBOTICS

**Course Objectives**

The course is intended for students to:

- Understand the Robot coordinate system and control system
- Learn different types of Robot sensors and actuators
- Identify different types of Robot grippers and their applications.
- Acquire Knowledge on kinematics and vision systems used for different Robots

**Course Outcomes**

After completion of the course the student is able to:

- Gain knowledge about basic concepts of robots.
- Appreciate the usage of different actuators, sensors and grippers in Robotics.
- Analyze the direct and the inverse kinematic problems.
- Able to identify the applications of Machine Vision in Robotics.

**UNIT I:**

**Basic Concepts:**

An over view of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

**UNIT II:**

**Sensors:**

Sensor characteristics, Position sensors, Velocity sensors, Acceleration sensors, Force and Pressure sensors, Torque sensors, Microswitches, Light and infrared sensors, Touch and tactile sensors, Proximity sensors, Range finders.

**Unit III:**

**Actuators and Grippers:**

Characteristics of actuating system, Comparison of actuating systems, Hydraulic actuators, Pneumatic devices, Electric motors, Magneto-strictive actuators, Shape-Memory Metals, Electro-active Polymer Actuators.

Classification of Grippers, Drive system for Grippers, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks and Scoops, Gripper Force analysis and design, Active and Passive Grippers.

**UNIT IV:**

**Kinematics:**

Robots as Mechanisms, Matrix Representation, Homogeneous Transformation Matrices, Representation of Transformations, Inverse of Transformation Matrices, Forward and Inverse Kinematics with Equations.

**UNIT V:**

**Vision:**

Image acquisition, Illumination Techniques, Imaging Geometry, Basic Relationships between Pixels, Segmentation, Description, Segmentation and Description of 3-D Structures, Recognition, Interpretation.

**TEXT BOOKS**


1. Saeed B. Niku ,Introduction To Robotics : Analysis, Control, Applications ,Wiley, 2nd Edition .

2. Deb.S.R, "Robotics technology and flexible Automation", John Wiley


**REFERENCES**


1. Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.

2. K.S.Fu, R.C.Gonzalez, C.S.G Lee, "Robotics- Control ,Sensing ,Vision and Intelligence ",McGraw-Hill International Edition.

3. Klafter. R.D, Chimielewski. T.A, Negin. M, "Robotic Engineering–An integrated approach", Prentice Hall of India, New Delhi

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| **III Year B.Tech EEE - II Sem** | **L** | **T/P/D** | **C** |
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**(5IT72)RELATIONAL DATABASE MANAGEMENT SYSTEMS**

**Course Objectives:**

- **Todescribe** database management systems (DBMS) concepts and relational data model.
- **To employ** DBMS concepts to organize, maintain and retrieve information efficiently and effectively from a DBMS.
- To discuss the concepts of transactions and transaction processing systems
- To examine the issues and techniques relating to concurrency and recovery in multi-user database environments

**Course Outcomes:**

**After completion of the course the student is able to**

- **Describe** the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
- **Employ** the Relational Database Model to understand the Logical and Physical aspects of the DBMS architecture.
- **Analyze** and **apply** normal forms for real time database applications.
- **Evaluation** of transaction properties and file organization methods

**UNIT I**

Introduction to Databases and Database Management System - Database system Applications - Advantages of DBMS over File System - Data Models – Instances and schema - View of Data - Database Languages -DDL-DML - Database Users and Administrator - Database System Structure.

**UNIT II**

Database Design and ER diagrams – Attributes and Entity Sets – Relationships and Relationship Sets – Constraints - Keys - Design Issues - Entity-Relationship Diagram- Weak Entity Sets - Extended E-R Features- Database Design with ER model - Database Design for Banking Enterprise

**UNIT III**

Introduction to the Relational Model – Structure of RDBMS - Integrity Constraints over Relations – Enforcing Integrity Constraints – Querying Relational Data - Relational Algebra and Calculus.

Introduction to SQL- Data Definition commands, Data Manipulation Commands, Basic Structure, Set operations Aggregate Operations - Join operations - Sub queries and correlated queries, SQL functions , views ,Triggers, Embedded SQL.

**UNIT IV**

Functional Dependencies– Introduction , Basic Definitions, Trivial and Non trivial dependencies, closure of a set of dependencies, closure of attributes, irreducible set of dependencies- Schema Refinement in Database Design- Problems Caused by Redundancy – Decompositions – Problem Related to Decomposition —- Lossless Join Decomposition – Dependency Preserving Decomposition - FIRST, SECOND, THIRD Normal Forms – BCNF —- Multi valued Dependencies – Fourth Normal Form.

**UNIT V**

Transaction concept- Transaction state- Implementation of atomicity and Durability- Concurrent executions – Serializability, Recoverability

File Organization – Organization of records in file - Data Dictionary Storage – Indexing and Hashing – Basic Concepts , Ordered Indices,$B^+$Tree Index files, B- tree index files

**TEXT BOOKS:**

1. Database System Concepts, Silberschatz, Korth , Fifth Edition, McGraw hill (1,2,3 and 5 Units)
2. Introduction to Database Systems, C.J.Date, Pearson Education ($4^{th}$ Unit)

**REFERENCES:**

1. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
2. Database Management Systems, Raghu ramakrishnan, Johannes Gehrke, TATA Mc Graw Hill(1,2,3 and 5 Units)
3. Data base Systems design, Implementation, and Management, Peter Rob and Carlos Coronel 7th Edition.
4. Data Base Systems using Oracle : A simplified guide to SQL and PL /SQL, Shah, PHI

| III Year B.Tech EEE - II Sem | L | T/P/D | C |
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**Open Elective II**

## (5AE72) MODERN AUTOMOTIVE TECHNOLOGIES

**Course objectives:**

- Provide an overview on advanced engine control system concepts
- Study the concepts and drivetrain configurations of electric and hybrid electric vehicles
- Present principle, working and automotive applications of fuel cell and solar technology
- Aware of intelligent vehicle technologies like navigation, safety, security and comfort systems

**Course Outcome**

**After Completion of the course the student is able to**

- Apply advanced engine control system concepts in engineering
- Discuss electric and hybrid electric drive train technologies and drive train components
- Describe automotive applications of fuel cell and solar technology
- Appreciate the technological advancements driver assistance systems

**UNIT I**

**Advanced Engine Controls**

Concept of an electronic engine control system, electronic fuel injection - throttle body fuel injection, multi point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control, engine mapping, on-board diagnostics – engine control module and powertrain control module.

**UNIT II**

**Electric and Hybrid Vehicles**

Electric vehicles -Layout of an electric vehicle, performance, energy consumption, advantage and limitations. Hybrid electric vehicles -Concepts, types of hybrid drive train architecture, merits and demerits.

**UNIT III**

**Fuel Cell and Solar Vehicles**

Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

**UNIT IV**

**Telematics and Comfort Systems**

Global positioning system, geographical information systems, navigation system, automotive vision system, adaptive cruise control system, active suspension system, power steering and power windows.

**UNIT V**

**Safety and Security Systems**

Active and passive safety, airbags, seat belt tightening system, collision warning systems, anti lock braking systems, traction control system, electronic immobilizers, remote keyless entry, smart card system, number plate coding.

**TEXT BOOKS:**


1. William B Riddens, “Understanding Automotive Electronics”, 5th edition, Butter worth Heinemann Woburn,1998.
2. Mehrdad Ehsani, Yimin Gao, sebastien E. Gay and Ali Emadi, “Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2005.


**REFERENCES:**


1. “Automotive Hand Book” Robert Bosch, SAE, 5th edition, 2000.
2. Iqbal Husain, “Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
3. Ljubo Vlacic, Michel Parent and Fumio Harashima, “Intelligent Vehicle Technologies”, Butterworth-Heinemann publications, Oxford, 2001.
4. “Navigation and Intelligent Transportation Systems – Progress in Technology”, Ronald K Jurgen, Automotive Electronics Series, SAE, USA, 1998.

| III Year B.Tech EEE- II Sem | L | T/P/D | C |
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**(5BS72) ENTREPRENEURSHIP**

Course Objective:

- To introduce basics of entrepreneurship development and the skills set required for innovation.
- To Understand changing business trends to enhance decision making skills.
- To learn analytical and conceptual skills of identifying opportunities and check on their feasibility for start-ups.
- To motivate the engineers to choose entrepreneurship as a career for personal and societal growth.

Course Outcome:

After completion of the course the students are able:

- To identify business opportunities and equip themselves in preparing business plans
- To analyze and evaluate different proposals and its requirements for start-up's.
- To pitch the ideas to launch their own venture.
- To assess the impact of competition and find methods to overcome the problems in business.

**UNIT-1: Entrepreneurial Skills-Opportunities**

Entrepreneurship as a career, Personality and Skill Set of Entrepreneur, The Wisdom of Five WHY's and in action, Value and Growth-Stories of Successful Enterprises.
Innovation and Entrepreneurship: Three Learning Milestones of Innovation: Use of Minimum Viable Product-Startup's must tune the baseline towards the ideal-Pivot or Persevere.

**UNIT-2: Changing Business Environment-Role of Entrepreneur**

The Role of Quality and Design, Beyond "The right place at the right time", Current trends in Business, Entrepreneurial Management.

**UNIT-3: Origins Of Lean Start-up-Business Plans**

The Concept of Vision to Steering:From Start-Define-Learn-Experiment to Leap-Test-Measure-Pivot.

**UNIT-4: Validation of Projects and Products**

Projects Evaluation by Budgeting Techniques, Value vs Waste, Analogs and Antilogs, Analysis Paralysis, Why first products are not meant to be perfect-Experiences,Forecasting and Experimenting of Products.

**UNIT-5:Start-up Methods and Understanding Competition**

Accelerating Start-up's, optimization versus learning, Kanban Diagram of work as it progresses from stage to stage, the value of three A's: Actionable, Accessible and Auditable, Engines of growth to determine product/market fit,adopting smaller batches, reasons for Failures in Start-up's, Pricing Strategies Based On Competition

**TEXT BOOKS:**

1. Eric Ries, "The Lean Startup", Crown Business, New York.v.3.1.

2.Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2001.

3.S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2001.

**REFRENCES:**

1. Mathew Manimala, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis,Biztrantra ,2nd Edition ,2005

2. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews,Tata McGraw-Hill, 1996.

3. P.Saravanavel, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai - 1997.

4. Arya Kumar. Entrepreneurship. Pearson. 2012

5. Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning.2012

**III Year B.Tech EEE – IIsem**

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## (5EE56) POWER SYSTEMS LABORATORY

**Course Prerequisites**: Power Systems-I, Power Systems-II, Switch gear and Protection, Power System Analysis

**Course Objectives:**

- To perform simulation experiments in various softwares.
- To observe the characteristics of IDMT, OV/UV, Differential relays.
- To perform fault analysis on Generators, transformers, Transmission line models.

**Course Outcomes:**

After completion of this course the student is able to

- Perform load flow solution by using various methods
- Analyze different relays
- Test CT and PT's, insulator strings.
- Determine sequence impedance and fault currents of Generator, transformer and transmission line models.

**List of experiments:**

1. Characteristics of Electromagnetic IDMT over current relay.
2. Characteristics of Micro Processor based Over voltage/Under voltage relay.
3. Differential protection of 1-Φ transformer.
4. Testing of CT and PT's, insulator strings.
5. Fault location of underground cable.
6. Measurement of Capacitance of 3-core cables.
7. Determination of sequence impedances of a 3-Φ synchronous machine.
8. Determination of sequence impedances of a 3-Φ Transformer.
9. Formation of $Y_{BUS}$
10. Load flow analysis with GS Method.
11. Load flow analysis with FDLF method.
12. Transient Stability Analysis for Single Machine connected to Infinite Bus by Point by Point Method.
13. Frequency and power deviation of two area load frequency control.
14. Fault analysis of transmission system.
15. Characteristics of solar PV Systems.
16. Inverter control for Solar PV based systems.

**Minimum of Ten experiments need to be conducted.**

**III Year B.Tech EEE – II Sem**

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## (5EC56) MICROPROCESSORS AND MICROCONTROLLERS LABORATORY
## (Common for EEE, ECE& EIE)

**Course Prerequisites**: Concepts of Digital Design and Basic Programming

**Course Objectives**

- To understand internal structure of processors and controllers
- To provide practical knowledge on programming 8086/8051 to perform various operations.
- Interface various I/O devices to 8086/8051
- Design and develop digital systems for embedded applications and know the process to meet desired needs within realistic constraints

**Course Outcomes**

After completion of this course the student is able to

- Enhance programming skills for simple and complex tasks used in various engineering disciplines.
- Apply the knowledge of interfacing techniques to design processor/ controller based systems

To apply the concepts in the design of microprocessor/microcontroller based systems in real time applications

1. Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086 / 8051.
7. Interfacing stepper motorto 8086 / 8051.
8. Programming using arithmetic, logical and bit manipulation instructions of 8051.
9. Program and verify Timer/ Counter in 8051.
10. Program and verify Interrupt handling in 8051
11. UART Operation in 8051.
12. Communication between 8051 kit and PC.
13. Interfacing LCD to 8051.
14. Interfacing Matrix / Keyboard to 8051.

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| **III Year B.Tech EEE –II Sem** | **L** | **T/P/D** | **C** |
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**(5BS03) ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY**
**(Common for all Branches)**

**Introduction**

This course aims to offer students a practical approach to Technical Writing, and provide a relevant, contemporary and authoritative introduction to the dynamic field of technical communication that prepares them for Workplace Communication. Each unit in the syllabus is devised so as to include a writing component as well as an oral component.

**Course objectives:**

- enable the students to create clear, accurate, and succinct content to write business letters, resume, SOP, Proposals and Technical Reports for academics as well as for workplace
- enable students to adjust technical content to meet the needs of a specific target audience
- groom students to speak accurately and fluently and prepare them for real world activities through behavioral skills.
- train students in soft skills through role play and group discussion to improve their EQ.

**Course Outcomes:**

Students will be able to:

- summarize and synthesize information and produce technical writing that is required in academics as well as in the engineering profession
- write covering letters, resume, SOP, Project Proposals and Technical Reports
- speak fluently and address a large group of audience and participate in debates and discussions.
- negotiate terms, manage complex situations through interpersonal skills, persuade people and make quick decisions.

**Methodology**

**Writing Component**

A Process- Genre methodology will be used in teaching the technical genres. This method would enable students to understand the use of particular lexico-grammatical patterns required of in the context of technical writing. They would learn to use language to express the particular communicative intent that is required of in the context of writing these genres.

**Syllabus Outline**

**UNIT I**

- Oral Communication :Talking About Yourself
- Applications and Covering letters
- Resume Writing
- Verbal Ability: Vocabulary ( Technical and Non-Technical) reading and listening (analysis and reasoning)

**UNIT II**

- Oral Communication: Making Presentations
  - Writing an SOP
  - Summarizing and Synthesizing Information

**UNIT III**

- . Oral Communication: Group Discussions
- Writing Abstracts

**UNIT IV**

- Oral Communication : Debate
- Writing Reports

**Unit V**

**Soft Skills**

**REQUIRED TEXT AND MATERIALS**

- Ashraf Rizvi, M (2005). Effective Technical Communication, Tata Mc Graw Hill Publishing Company Limited, New Delhi.
- Anderson, Paul V. (2003). Reports. In Paul V. Anderson's Technical Communication: A Reader-Centered Approach ( 5th ed..) (pp. 457-473). Boston: Heinle.
- William S. Pfeiffer, (2012) Technical Communication: A Practical Approach (7th ed.) Longman

**REFERENCES**

- Burnett, Rebecca. Technical Communication. 5th Ed., Heinle, 2001.
- Gerson Sharon J. and Steven Gerson : Technical Writing Process and Product. 3rd edition, New Jersey: Prentice Hall 1999
- Markel, Mike**.** Technical Communication: Situations and Strategies (8th EDITION (2006-2007)
- R. C. Sharma and K. Mohan, Business Correspondence and Report Writing, Third Edition, TMH, 2002. (Indian Edition)
- M. Raman and S. Sharma, Technical Communication : Principles and Practices, OUP, 2004. (Indian Edition)

| IV Year B.Tech EEE – I Sem | L | T/P/D | C |
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## (5EE13) ELECTRICAL MEASUREMENTS & INSTRUMENTATION

**Course Prerequisites**: Circuit Theory, Electrical Machines – II, Electro Magnetic Field Theory

**Course Objectives**

- To introduce the basic concepts related to the operation of Electrical and Electronic Measuring Instruments.
- To measure high voltages & high currents in distribution systems using Instrument transformers
- To measure unknown inductance, Resistance, capacitance using D.C Bridges & A.C Bridges
- To know the operation of AC and DC potentiometers

**Course Outcomes**

After completion of this course the student is able to

- Apply the knowledge about the instruments to use them more effectively
- Suggest the kind of instrument suitable for typical measurements
- Apply the knowledge about transducers to use them effectively.
- Apply the knowledge about instrument transformers to use them more effectively in distribution systems.

**UNIT-I**

**MEASURING INSTRUMENTS**

Classification of measuring Instruments-Deflecting, Control and Damping Torques-PMMC, Moving iron type instruments-Expression for the deflecting torque and control torque-Extension of range using shunts and series resistance, dynamometer type instruments, single phase energy meter, errors and calibration, Measurement of Power and Energy, three ammeter and three voltmeter methods-Electrostatic Voltmeters, Power factor meters

**UNIT-II**

**MEASUREMENT OF RESISTANCE, INDUCTANCE AND CAPACITANCE**

Measurement of low, medium and high resistances, insulation resistance measurement, Megger, AC bridges for inductance and capacitance measurement.

**UNIT-III**

**INSTRUMENT TRANSFORMERS**

Current and Potential transformers, ratio and phase angle errors, testing, measurement of power using instrument transformers

**Potentiometers**: AC and DC potentiometers, Calibration of Voltmeters and Ammeters using potentiometers.

**UNIT-IV**

**ELECTRONIC MEASUREMENTS**

Electronic Voltmeter, Multimeter, Time, Frequency and phase angle measurements using CRO; Spectrum & Wave analyzer. Digital counter, frequency meter and storage oscilloscope.

**UNIT-V**

**INSTRUMENTATION**

Transducers, classification & selection of transducers, strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers, thermistors, thermocouples, photo-diodes & photo-transistors, encoder type digital transducers, signal conditioning and telemetry, basic concepts of smart sensors and application. Data Acquisition Systems.

**TEXT BOOKS:**


1. Electrical and Electronics measurements And Instrumentation by A.K.Sawhney, Dhanpat rai & co publications.
2. Electrical Measurement and Measuring Instruments by Golding, E.W, Sir Issac Pitman and Sons, 1960, 3rd Edition.
3. Modern Electronic Instrumentation and Measurement Techniques by Helfrick Albert D, Cooper William. DPrentice-Hall of India, Reprint 1992.


**REFERENCES:**


1. Instrumentation Measurement and Feedback by Jones, B.E, Tata McGraw-Hill, 1986.

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**IV Year B.Tech EEE – I sem**

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## (5EE14) POWER SYSTEM OPERATION AND CONTROL

**Course Prerequisites**: Power System-I, Control Systems, Electrical Machines – III

**Course objectives:**

- To get awareness on economic load scheduling of thermal and hydro power plants
- Impact of frequency on load and generator.
- To get awareness on modeling of load frequency control of a power system
- To get awareness on reactive power control of a power system

**Course out comes**

After completion of this course the student is able to

- Analyze the optimal scheduling of power plants
- Analyze the steady state behavior of the power system for voltage and frequency fluctuations
- Describe reactive power control of a power system
- Should be able to design suitable controller to dampen the frequency and voltage steady state oscillations.

### UNIT – I

### ECONOMIC OPERATION OF POWER SYSTEMS

Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected, Unit commitment.

Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

### UNIT – II

### HYDROTHERMAL SCHEDULING

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, Scheduling problems-Short term hydrothermal scheduling problem.

### MODELLING OF TURBINE

Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

**UNIT – III**

**MODELING OF GENERATOR AND AUTOMATIC CONTROLLERS**

Modelling of Generator (Steady State and Transient Models): Classical model of Synchronous Machine, Description of Swing Equation (No Derivation) and State-Space second order model of Synchronous Machine.

Modelling of Governor: Mathematical Modelling of Speed Governing System – Derivation of small signal transfer function.

Modelling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model.

**UNIT –IV**

**SINGLE AREA LOAD FREQUENCY CONTROL**

Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case.Proportional plus Integral control of single area and its block diagram representation, steady state response.

**TWO-AREA LOAD FREQUENCY CONTROL**

Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control.Automatic Generation Control and Economic dispatch control.

**UNIT – V**

**REACTIVE POWER CONTROL**

Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.

**TEXT BOOKS:**


1. Electrical Power Systems by C.L.Wadhwa, Newage International-3rd Edition
2. Modern Power System Analysis – by I.J.Nagrath and D.P.Kothari Tata M Graw – Hill Publishing Company Ltd, 2nd edition.
3. Electric Energy systems Theory – by O.I.Elgerd, Tata Mc Graw-hill Publishing Company Ltd., Second edition.
4. Operation and Control in Power Systems by P.S.R.Murthy, BS Publications, 2011, Second edition


**REFERENCES:**


1. Power System Analysis and Designby J.Duncan Glover and M.S.Sarma., THOMPSON, 3rd Edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by Hadi Saadat , TMH Edition.

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| **IV Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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**(5EC17) PRINCIPLES OF DIGITAL SIGNAL PROCESSING**

**Course Prerequisites**: Network Analysis, Advanced Calculus, Linear and Digital IC applications

**Course Objectives**

- To understand characteristics of discrete time signals and systems
- To analyze and process signals using various transform techniques
- To understand various factors involved in design of digital filters
- To understand the features of TMS24XX processors.

**Course Outcomes**

After completion of this course the student is able to

- Analyze and process signals in the discrete domain
- Design filters to suit specific requirements for specific applications
- Perform statistical analysis and inferences on various types of signals
- Design and control the electrical drive using different 24xx processors.

**UNIT-I**

**INTRODUCTION**

Classification of continuous time Signals & Systems. Linear shift invariant systems, stability and causality, Sampling of Continuous signals- Introduction to digital signal processing-Sampling process-Sampling theorem.

Classification of discrete time signals and sequences

**UNIT – II**

**FOURIER ANALYSIS**

Introduction toDiscrete Fourier series, Discrete Fourier Transform: Properties of Discrete Fourier Transform, linear convolution and circular convolution of sequences using DFT, Computation of DFT, Relation between DFT and Z-Transform.

Fast Fourier transform: Radix -2 decimation in time and decimation in frequency FFT algorithms, Inverse FFT.

**UNIT – III**

**Z- TRANSFORM**

Introduction to Z-transform, Properties of Z- Transform, Inverse Z- Transform, Application of Z- Transforms for Linear constant coefficient difference equations, Realization of Digital filters, system function – stability criterion.

**UNIT – IV**

**IIR FILTERS**

Analog filter approximations-Design of Butterworth Chebyshev filters, Design of IIR digital filter from analog filter using- impulse invariant and bilinear transformation techniques, design examples, realization of IIR filters-direct, canonic, cascade, and parallel forms.

**UNIT – V**

**FIR FILTERS**

Characteristics of FIR Digital Filters, Frequency response, Design of FIR filters using – Rectangular, Hamming, Bartlett- windows , frequency sampling technique, comparison of FIR and IIR filters, realization of IIR filters-direct, cascade forms. Architecture and features of TMS 320F 2407, Applications of DSP.

**TEXT BOOKS:**


1. Digital signal processing: principles, algorithms and applications-John G.Proakis, D.G.Manolakis, 3rd edition, PHI-2007.
2. Discrete time signal processing-A.V.Oppenheim and R.W.Schaffer,PHI,2009.
3. TMS 320F 24xx Manuals


**REFERENCES:**


1. Digital signal processing-Fundamentals and applications-LiTan, Elsevier,2008.
2. Fundamentals of digital signal processing using MATLAB-Robert J.Schilling, Sandra L.Harris, Thomson, 2007.
3. Digital signal processing-S.Salivahanan, A.Vallavaraj, C.Gnanapriya, TMH, 2009.
4. Discrete systems and digital signal processing with MATLAB-Taan S.ElAli,CRC Press,2009.
5. P Venkata Ramani, M.Bhaskar, “Digital Signal Processor; Architecture, Programming & Application”, TataMcGrawHill-2001

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## (5EE15) SWITCH GEAR AND PROTECTION

**Course Prerequisites**: Electrical Machines – II & III, Power System-II, Circuit Theory

**Course Objectives:**

- Introduce students to power system protection and switch gear.
- To introduce all kinds of circuit breakers and relays for protection of Generators, Transformers and feeder bus bars from Over voltages and other electrical hazards.
- Describe neutral grounding for overall protection of electrical systems.
- To enhance students knowledge of overvoltage protection and data transmission.

**Course Outcomes:**

After completion of this course the student is able to

- Students are knowledgeable in the field of power system protection and circuitbreakers.
- Students are knowledgeable in the field of relays
- Students will demonstrate and ability to design the relevant protection systems for the main elements of power systems
- Students are knowledgeable in the field of over voltage protection and the basics of insulation coordination.

### UNIT – I

### CIRCUIT BREAKERS

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages. - Restriking Phenomenon, Average and Max. RRRV- Numerical Problems. Current Chopping, Auto reclosures and Resistance Switching - CB ratings and Specifications: Types, testing of circuit breakers - Numerical Problems.

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

### UNIT – II

### ELECTROMAGNETIC AND STATIC RELAYS

Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. Relays Classification: Instantaneous, DMT and IDMT types.

Application of relays: Over current / under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison.

Static Relays: Static Relays versus Electromagnetic Relays.

**UNIT – III**

**EQUIPMENT PROTECTION**

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection - Numerical Problems. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT's Ratio, Buchholtz relay Protection. Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay. Protection of Bus bars – Differential protection Feeder Protection and Relay coordination

**UNIT – IV**

**NEUTRAL GROUNDING**

Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

**UNIT – V**

**PROTECTION AGAINST OVER VOLTAGES**

Over Voltages in Power Systems, Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination - BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

**TEXT BOOKS:**


1. Switchgear and Power System Protection by Ravindra P.Singh, PHI, 2009.
2. Switch gear and Protection, by Haroon Asf, Khanna Book Publishing Co.(P)Ltd, 2nd edition.
3. Power System Protection and Switch Gear by Badri Ram and D.N.Vishwakarma, McGraw – Hill professional.
4. Switchgear Protection and Power system by Sunil. S. Rao, Khanna Book Publishing Co.(P)Ltd, 13th Edition.


**REFERENCES:**


1. Fundamentals of Power Sytems, Y.G.Paitankar, S.R.Bhinde, PHI Publications, 2nd Edition.
2. Advanced Power System Analysis and Dynamics by L.P.Singh, New Academic Science, 6th Edition

**VNR Vignana Jyothi Institute of Engineering and Technology**

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**(5EE73) ADVANCED CONTROL SYSTEMS**

**Course Prerequisites:** Control Systems

**Course Objectives**

- To cater the knowledge of basic and modern control system for the real time analysis and design of control systems.
- To provide adequate knowledge of non linear systems.
- Analyzing the concept of stability of nonlinear systems and categorization.
- To provide comprehensive knowledge of optimal control and modern control.

**Course Outcomes**

After completion of this course the student is able to

- Apply the knowledge of basic and modern control system for the real time analysis and design of control systems.
- Understand the concepts of state variables analysis.
- Analyze the concept of stability of nonlinear systems and optimal control.
- Analyze the concepts of optimal control and modern control

**UNIT – I**

**STATE SPACE ANALYSIS, CONTROLLABILITY AND OBSERVABILITY**

State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms – Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form. Tests for controllability and observability for continuous time systems – Time varying case, time invariant case, Principle of Duality, Controllability and observability form Jordan canonical form and other canonical forms.

**UNIT – II**

**DESCRIBING FUNCTION ANALYSIS& PHASE-PLANE ANALYSIS**

Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

**UNIT-III**

**STABILITY ANALYSIS**

Stability in the sense of Lyapunov, Lyapunov's stability and Lypanov's instability theorems.Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.

**UNIT – IV**

**MODAL CONTROL& CALCULUS OF VARIATIONS**

Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer.

Minimization of functionals of single function, Constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints.Euler Lagrange Equation.

**UNIT –V**

**OPTIMAL CONTROL**

Formulation of optimal control problem.Minimum time, Minimum energy, minimum fuel problems. State regulator problem. Output regulator problem.Tracking problem, Continuous-Time Linear Regulators.

**TEXT BOOKS:**


1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996


**REFERENCES:**


1. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998
2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.
2. Systems and Control by Stainslaw H. Zak , Oxford Press, 2003.

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## (5EE74) MODERN POWER ELECTRONICS

**Course Prerequisites**: Power Electronics

**Course Objectives**

- To understand the operation of various semi conductor devices
- To analyze resonant pulse converters
- To describe the operation of multi level inverters with switching strategies for high power applications
- To appreciate the design of switch mode power supplies.

**Course Outcomes**

After completion of this course the student is able to

- Comprehend the semiconductor device switch characteristics
- Analyze and assess multilevel inverters and resonant pulse converters
- Design switch mode power supplies
- Analyze and assess resonant pulse converter.

**UNIT- I**

**MODERN POWER SEMICONDUCTOR DEVICES**

Modern power semiconductor devices – MOS Turn Off Thyristor (MTO) – Emitter Turn Off Thyristor (ETO) – Intergrated Gate-Commutated Thyristor (IGCTs) – MOS-Controlled Thyristors(MCTs) – Static Induction Thyristors (SITHs) – Power integrated circuits (PICs) – symbol, structure and equivalent circuit – comparison of their features.

**UNIT-II**

**TWO-LEVEL VOLTAGE SOURCE INVERTER**

Introduction, Sinusoidal PWM, Modulation Scheme,Harmonic Content, Overmodulation, Third Harmonic Injection PWM, Space Vector Modulation, Switching States, Space Vectors, Dwell Time Calculation, Modulation Index, Switching Sequence, Spectrum Analysis, Even-Order Harmonic Elimination, Discontinuous Space Vector Modulation.

**UNIT- III**

**MULTILEVEL INVERTERS**

Need for Multilevel Inverters, Multilevel Concept, Classification of Multilevel Inverters – Diode Clamped Multilevel Inverter- Principle of Operation – Main Features - Flying Capacitor Multilevel Inverter – Principle of Operation – Main Features, Cascaded Multilevel Inverter, Principle of Operation- Features, Applications of Multilevel Inverters.

**UNIT-IV**

**DC-DC SWITCH-MODE CONVERTERS AND SWITCHING DC POWER SUPPLIES**

Linear Power Supplies, Overview of Switching Power Supplies, Dc-Dc Converters with Electrical Isolation, Control of Switch Mode Dc Power Supplies, Power Supply Protection, and Electrical Isolation in the Feedback loop, designing to meet the Power Supply Specifications.

Control Of Dc-Dc Converter, Fly Back, Forward, Full-Bridge Dc-Dc Converter.

**UNIT-V**

**RESONANT CONVERTERS**

Introduction to Resonant Converters, Classification of Resonant Converters, Basic Resonant circuit concepts,Series Resonant Circuit-Parallel Resonance Circuit, Resonant Switch Converters: ZCS Resonant Buck Converter, ZVS Resonant Boost Converter

**TEXT BOOKS:**


1. Power electronics circuits, Devices and applicationsby M.H. Rashid PHI –I edition –1995.
2. Power Electronics converters, Applications and Design byNed Mohan, Tore M. Undeland and William P. Robbins, A John Wiley Sons, Inc., Publication 3rd Edition.


**REFERENCES:**


1. High-Power Converters and AC Drives by Bin Wu, A John Wiley & Sons, Inc., Publication
2. Switch mode Power Supply Handbook 3/e, Keith Billings, Taylor Morey, Mc GrawHill.
3. Fundamentals of Power Electronics by Robert W. Erickson , Dragan Maksimovic, KLUWER ACADEMIC PUBLISHERS 2nd Edition.
4. Pulse-width Modulated DC–DC Power Converters by Marian K. Kazimierczuk, John Wiley and Sons, Ltd, Publication

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## (5EE75)RENEWABLE POWER GENERATION TECHNOLOGIES

**Course Pre requisites :**Environmental science and physics

**Course Objectives**

- To provide necessary knowledge about the modeling, design and analysis of various PV systems
- To show WECS environmentally sustainable alternative to the world's energy supplies
- To understand the power conditioning of PV & WECS system's power output

**Course Outcome:**

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

- Model, analyze and design various photovoltaic systems
- Design appropriate power conditioning system for WECS system
- Design efficient storage systems for stand alone Renewable Energy systems

**Unit I**: **Introduction**

Trends in energy consumption - World energy scenario - Energy sources and theiravailability - Conventional and renewable sources - need to develop new energytechnologies.

**Unit II**: **Photovoltaic Energy Conversion**

Photovoltaic Energy Conversion: Solar radiation and measurement - solar cells and their characteristics - influence of insulation and temperature - PV arrays - Electrical storage with batteries - solar energy availability in India - Switching devices for solar energy conversion - Maximum power point tracking. DC Power conditioning converters -maximum power point tracking algorithms - AC power conditioners - Line commutated inverters - synchronized operation with grid supply - Harmonic problem – Applications.

**Unit III**: **Wind Energy Conversion (Wec)**

Basic Principle of wind energy conversion - nature of wind - wind survey in India - Power in the wind - components of a wind energy - conversion system - Performance of induction generators for WECS - classification of WECS.

**Unit IV**: **Self-Excited & Grid Connected Wecs**

Self excited induction generator for isolated power generators - Theory of self-excitation - Capacitance requirements - Power conditioning schemes - Controllable DC Power from Self excited induction generators (SEIGs) - system performance. Grid Connected WECS: Grid connectors concepts - wind farm and its accessories - Grid related problems - Generator control - Performance improvements - Different schemes - AC voltage controllers - Harmonics and PF improvement .

**Unit V**: **Stand Alone Power Supply Systems**Wind/solar PV integrated systems - Optimization of system components

**Storage Systems:** Energy Storage Parameters - Lead–Acid Batteries – Ultra capacitors - Flywheels -Superconducting Magnetic Storage System - Pumped Hydroelectric Energy Storage -Compressed Air Energy Storage -Storage Heat -Energy Storage as an Economic Resource.

**TEXT BOOKS**:

1. Rai, G.D., “Non-conventional Energy Sources”, Khanna Publishers Limited, NewDelhi, 2002..

2. Mukund R Patel, “Wind and Solar Power Systems”, CRC Press, 2004.

**REFERENCES:**

1. Rai, G.D., “Solar Energy Utilization”, Khanna Publishers Limited, New Delhi,1997

2. Gray.L.Johnson, “Wind energy systems”, Prentice Hall Inc., Singapore, 1985.

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**IV Year B.Tech EEE – II sem**

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## (5EC86) BASICS OF NANO SCIENCE AND TECHNOLOGY

**Course Prerequisites:** Advanced Engineering Physics

**Course Objectives**

- To introduce basics in nano science with some of the pre- requisite principles and concepts
- To understand the size dependent physical properties of materials with nano dimensions
- To learn the principles of various preparation methods of nano materials
- To know the different characterization techniques of nano materials,related instruments and the basic electronic devices at nano scale

**Learning Outcomes**

After completion of this course the student is able to

- Appreciate the importance of nano dimensional materials and their applications.
- Realize and explain that the properties of nano materials are size dependent and vary from corresponding bulk materials
- Demonstrate the skills required to prepare some of the nano materials in the laboratory
- Appreciate the applications of nano electronic devices and understand their basic principles.

**UNIT-I**

**Basics of Nano science**

Introduction to quantum physics, electron as waves, wave mechanics, Schrödinger equation. and particle in a box, Heisenberg's uncertainty principle, exclusion principle, Free electron theory (qualitative idea) and its features, Idea of band structure, Density of states for zero, one, two and three dimensional materials, Quantum confinement, Quantum wells, wires, dots, Factors affecting by particle size

**UNIT II**

**Properties of Nano materials**

Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties of nano materials. Electrical and mechanical properties of Carbon nanostructures

**UNIT III**

**Synthesis of Nano materials**

**Physical methods:** Bottom up-Ball Milling, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Gas evaporation.

**Chemical methods:** Top downChemical vapor deposition, Synthesis of metal & semiconductor nano particles by colloidal route, Sol-gel method, Combustion method.

**UNIT IV**

**Nano materials characterization**

XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Surfaceelectron microscopy, Transmission electron microscopy, Scanning tunneling microscopy,Atomic force microscopy, Raman spectroscopy

**UNIT V**

**Nano electronics**

The p-n-junction and bipolar transistor, Metal semiconductor and metal insulator, semiconductor junction, field effect transistor.

Nano scale MOSFETS, limits to scaling, system integration, interconnects, Nanowire Field Effect Transistors, Single Electron Transistors, Carbon nanotube transistors, Memory Devices

**TEXT BOOKS AND REFERENCES:**


1. Nanotechnology: Principles & Practicals. Sulbha K. Kulkarni, Capital Publishing Co.New Delhi.
2. Carbon nanotechnology-Recent developments in Chemistry, Physics, materials science and device Applications -Elsevier Science
3. Nanostructures & Nanomaterials Synthesis, Properties & Applications**.** Guozhong Cao, Imperials College Press London.
4. Nanomaterials: Synthesis, Properties & Applications**.** Edited by A.S. Edelstein & R.C.Commorata.Institute of Physics Publishing, Bristol & Philadelphia.
5. Introduction to Nanotechnology. C.P. Poole Jr. and F. J.Owens, Wiley Student Edition.
6. Nano: The Essentials. T.Pradeep , McGraw Hill Education.
7. Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience Edward L. Wolf (2nd Ed.),WILEY-VCH, 2006
8. Nanoscience and Technology: Novel Structure and Phenomena- Ping and Sheng
9. Hand Book of Nanotechnology, Bhushan
10. Sol-gel science and technology processing, characterization and applications; S. Sakka, Kluwer Acad. Publ.
11. Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices, Goser et al,
12. Handbook of Semiconductor Nanostructures & Nanodevices, A. A. Balandin and K L. Wang,
13. Hand book of Nanostructure materials and nanotechnology; H.S.Nalwa, (Vol.1-5), Acad. Press, Boston, 2000
14. Nanotechnology; Springer Verrlag, . T.J.Deming, Berlin, 1999
15. Nano CMOS Circuit and Physical Design, Banwong, Anurag Mittal;

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| **IV Year B.Tech EEE – I sem** | **L** | **T/P/D** | **C** |
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**Elective-II**

**(5EE76) HIGH VOLTAGE ENGINEERING**

**Course Prerequisites**: Electro Magnetic Field Theory, Circuit Theory, Advanced Physics

**Course Objectives:**

- To understand the Gaseous, liquid and solid dielectric behavior under High Voltage.
- To understand the generation methods of High A.C, Dc. & Impulse Voltages required for various application.
- To understand the measuring techniques of High A.C., D.C & Impulse voltages and currents.
- To understand the testing techniques for High Voltage Equipment.

**Course Outcomes:**

After completion of this course the student is able to

- Know how conduction and breakdown will occur in gases, liquids and solids dielectrics and different applications of these insulating materials in electrical power apparatus.
- Know the insulation testing of various components in power systems for different types of voltages, namely power frequency A.C, high frequency, switching or lightning impulses, for which generation of high voltages in laboratories is essential.
- Appreciate the necessity to measure the voltages and currents accurately, ensuring perfect safety to the personnel and equipment.
- Analyze the necessary condition for all the electrical equipment which are capable of withstanding the over voltages which met in service like natural causes lightning or system originated ones switching or power frequency transient voltages.

**UNIT- I**

**INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY AND APPLICATIONS**

Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

**UNIT- II**

**BREAK DOWN IN GASEOUS, LIQUID AND SOLID DIELECTRICS**

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law.Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

**UNIT- III**

**GENERATION OF HIGH VOLTAGES AND CURRENTS**

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

**UNIT- IV**

**MEASUREMENT OF HIGH VOLTAGES AND CURRENTS**

Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements. Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements

**UNIT- V**

**OVER VOLTAGE PHENOMENON AND TESTING OF ELECTRICAL APPARATUS**

Natural causes for over voltages – Lightning phenomenon, Over voltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems. Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

**TEXT BOOKS:**


1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.


**REFERENCES:**


1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. Extra High Voltage A.C. Transmission Engineering by Rakosh Das Begamudre, New Age International, 2007, Revised Edition

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| **IV Year B.Tech EEE – I sem** | **L** | **T/P/D** | **C** |
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**Elective-II**

**(5EE77) ELECTRICAL DISTRIBUTION SYSTEMSAND AUTOMATION**

**Course Prerequisites:** Power Systems-II, Switch Gear and Protection

**Course objectives:**

- To get awareness of distribution systems for load modeling
- To understand the design & working of substations.
- To know about system protection and the coordination course outcomes.
- To know about Distribution Automation

**Course outcomes:**

After completion of this course the student is able to

- Analyze the Electrical Distribution system for voltage drop and power loss calculations in lines.
- Analyze optimal conductor selection for distribution systems.
- Describe Distribution Automation objectives and SCADA
- Analyze the effect of series capacitor for voltage control.

**UNIT- I**

**GENERAL CONCEPTS**

Introduction to distribution systems, Load modeling and characteristics. Load factor, Coincidence factor, Contribution factor and Loss factor - Relationship between the Load factor and loss factor. Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.

**UNIT- II**

**DISTRIBUTION FEEDERS AND SUBSTATIONS**

Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system. Substations, Location of Substations: Rating of distribution substation, service area within primary feeders benefits derived through optimal location of substations.

**UNIT - III**

**DISTRIBUTION SYSTEM ANALYSIS**

Voltage drop and Power-loss calculations: Derivation for voltage drop and Power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

**UNIT - IV**

**PROTECTION**

Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, Line

Sectionalizes, and Circuit Breakers, Coordination of Protective Devices: General coordination procedure, Concepts of Smart grid and Demand Side Management.

**UNIT - V**

**Voltage Control**

Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

**Distribution Automation**

Need for DA, Objectives & Functions of DA, SCADA, Consumer information service, GIS, Automatic meter reading

**TEXT BOOKS:**

1. Electric Power Distribution system, Engineering by Turan Gonen, TMH.
2. Electric Power Distribution by A.S. Pabla, Tata Mc Graw-hill Publishing Company, 1997, 6th edition.

**REFERENCES:**

1. Electrical Power Distribution and Automation by S.Sivanagaraju,V.Sankar,Dhanpat Rai and Co.
2. Electrical Power Distribution Systems by V.Kamaraju,TMH Publishers, 2nd Edition.

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| **IV Year B.Tech EEE – I sem** | **L** | **T/P/D** | **C** |
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**Elective-II**

## (5EE80) ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC
## (Common for EEE, ECE& EIE)

**Course Prerequisites:** Control Systems

**Course Objectives**

- To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
- To expose the students to the concepts of feed forward neural networks and about feedback neural networks.
- To teach about the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control
- To teach the design of fuzzylogic controllers.

**Course Outcomes:**

After completion of this course the student is able to

- The concepts of feed forward neural networks and learning and understanding of feedback neural networks.
- Concept of fuzziness involved in various systems and fuzzy set theory.
- Comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic.
- Adequate knowledge of application of fuzzy logic control to real time systems.

**UNIT – I**

**INTRODUCTION TO NEURAL NETWORKS**

Introduction, Humans and Computers, Biological Neuron and organization of the brain, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model and Design of logic gates, Historical Developments, Potential Applications of ANN.

**ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS**

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

**Unit–II**

**SINGLE LAYER FEED FORWARD NEURAL NETWORKS**

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem and concepts, Limitations of the Perceptron Model, Applications.

**MULTILAYER FEED FORWARD NEURAL NETWORKS**

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Learning Difficulties and Improvements.

**Unit - III**

**ASSOCIATIVE MEMORIES**

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network, Applications.

**Unit – IV**

**CLASSICAL AND FUZZY SETS**

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Operations, properties, fuzzy relations, membership functions.

**Fuzzy Logic System Components**

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

**UNIT- V**

**APPLICATIONS**

**Neural network applications:** Process identification, control, fault diagnosis and load forecasting.

**Fuzzy logic applications:** Fuzzy logic control, Design and Analysis

**TEXT BOOKS:**


1. Neural Networks, Fuzzy logic, Genetic algorithm - synthesis and applications by Rajasekharan and Rai, PHI Publications.
2. Artificial neural networks by B.Yegnarayana, PHI publications.


**REFERENCES:**


1. Neural Networks by James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks by Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.
5. Introduction to Artificial Neural Systems by J.M.Zurada, Jaico Publishing House.
6. Introduction to Neural Networks using MATLAB 6.0 by S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH, 2006.

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## (5EC79) INTERNET OF THINGS

**Course Objectives**

- To understand the basics of Internet of Things
- To get an idea of some of the application areas where Internet of Things can be applied
- To understand the concepts of web and middleware for Internet of Things
- To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing and IOT protocols

**Course Outcomes**

**After Completion of the course the student is able to**

- Identify and design the new models for market strategic interaction
- Design business intelligence and information security for Web
- Analyze various protocols for IoT and Design different models for network dynamics

**UNIT I**

**Introduction**

Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user. Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware forIoT –IoT Information Security

**UNIT II**

**IOT Protocols**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols –Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNetProtocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security.

**UNIT III**

**Web of Things**

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization forWoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and BusinessIntelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards– Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture

**UNIT IV**

**Integrated**

Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things -Network Dynamics: Population Models – Information Cascades - Network Effects – NetworkDynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon

**UNIT V**

**Applications**

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative ProductionEnvironments - Resource Management in the Internet of Things: Clustering, Synchronization andSoftware Agents. Applications - Smart Grid – Electrical Vehicle Charging

**TEXT BOOKS**

1. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press –2012
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011

**REFERENCES**

1. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applicationsand Protocols”, Wiley, 2012
2. The Internet of Things: Applications to the Smart Grid and Building Automation by – OlivierHersent, Omar Elloumi and David Boswarthick - Wiley -2012
3.Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley andJon Kleinberg, Cambridge University Press - 2010

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**IV Year B.Tech EEE – I Sem**

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## (5EE57) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LABORATORY

**Course Prerequisites**: Electrical Measurements and Instrumentation

**Course objectives**

- To calibrate LPF Watt Meter, energy meter, P.F Meter using electro dynamo meter type instrument as the standard instrument
- To determine unknown inductance, resistance, capacitance by performing experiments on D.C Bridges &A.C Bridges
- To determine three phase active & reactive powers using single wattmeter method practically
- To determine the ratio and phase angle errors of current transformer and potential transformer.

**Course outcomes**

After completion of this course the student is able to

- get the ability to choose instruments
- can test any instrument
- can find the accuracy of any instrument by performing experiment
- can calibrate PMMC instrument using D.C potentiometer

**Part - A**

1. Calibration and Testing of single phase energy Meter
2. Measurement of tolerance of batch of low resistances by Kelvin's double bridge
3. Measurement of voltage, current and resistance using dc potentiometer
4. Schering Bridge and Anderson bridge.
5. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
6. Calibration of LPF wattmeter by Phantom testing
7. Measurement of Iron loss in a bar specimen using Epstein square.
8. Dielectric testing of transformer oil
9. Calibration of dynamometer type power factor meter.
10. Measurement of percentage error and phase angle of the given CT using mutual inductance method.

**Part - B**

1. Measurement of Displacement with the help LVDT
2. Measurement of different ranges of temperatures using i)RTD ii)Thermo couple
3. Measurement of voltage, frequency &phase with the help of CRO
4. Measurement of load with the help of strain gauges
5. Measurement of % ratio error and phase angle of given C.T. by Silsbee's method.

**Minimum of Ten experiments (Eight from PART-A and Two from PART-B) need to be conducted**

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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**(5EC62) PRINCIPLES OF DIGITAL SIGNAL PROCESSING LABORATORY**

**Course Prerequisites:** Digital Signal Processing

**Course Objectives**

Simulation and implementation on DSP processor

- To verify properties of a discrete system.
- To learn various transforms on digital signals.
- To understand the design of digital filters.
- To understand concepts to design the drives.

**Course Outcomes**:

After completion of this course the student is able to

- To apply knowledge of digital filter design for various applications.
- To analyze various signals in transform domain.
- Design digital filters using different transformation techniques.
- To perform real time experiments on processors such as motor control.

**The following experiments are to be performed using MATLAB**

1. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse step, Square, Saw tooth, Triangular, Sinusoidal, Ramp.
2. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Verification of Linearity and Time Invariance Properties of a given Continuous / Discrete System.
4. Linear Convolution and Circular Convolution
5. Computation of Unit sample, Unit step and sinusoidal responses of the given LTI system and verifying its Physical reliazability and stability properties.
6. Discrete Fourier Transform / Inverse Discrete Fourier Transform
7. Power Density Spectrum
8. Sampling theorem Verification.
9. Implementation of Filters using IIR
10. Implementation of Filters using FIR

**The following Experiments are to be performed using DSP Processor Kit.**

1. Generation of sine wave and square wave using DSP trainer kit
2. PWM generation on DSP training kit
3. To Verify Linear Convolution and Circular Convolution
4. Implementation of FIR (Low Pass/High Pass) using Windowing Technique.
   a. Using Rectangular Window
   b. Using Triangular Window
   c. Using Kaiser Window
5. Implementation of IIR Filter (Low Pass and High pass).

6. To compute Power Density Spectrum(PDS) of a Sequence
7. Stepper Motor Control.
8. Three phase IM speed control.
9. Brushless DC Motor Control

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**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE – I Sem** | **L** | **T/P/D** | **C** |
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**(5EE91) INDUSTRY ORIENTED MINI PROJECT**

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**IV Year B.Tech EEE – II Sem**

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## (5BS42)MANAGEMENT SCIENCE
## (Common for CSE, IT, ECE, EIE & EEE)

**Course Prerequisites: Business Economics and Financial Analysis**

**Course Objectives:**

The objective of this course is to:

- Understand the principles, functions, theories and practices of different management areas and to provide them with practical exposure to cases of success/failure in business.
- Expose with a systematic and critical understanding of organizational theory, structures and design.
- Comprehend conceptual models of strategic management and to familiarize with the tools of operations and project management.
- Understand the role of human relations in the management of operations and to provide basic insights into contemporary management practices.

**Course outcomes:**

Upon completion of this course students should be able to:

- Function effectively in multidisciplinary teams to accomplish a common goal of organizations.
- Apply theories to improve the practice of management.
- Appreciatethe management challenges associated with high levels of change in the organizations.
- Develop global vision and management skills at both a strategic level and interpersonal level.

**UNIT I**

**Introduction to management**

Concepts of management - nature, importance, and functions of management; Taylor's scientific management theory; Fayol's principles of management; Mayo's Hawthorne experiments; Maslow's theory of human needs; Douglas McGregor's theory X and theory Y; Herzberg's two-factor theory of motivation; System and contingency approach to management; Planning – meaning, significance, and types of plans; Decision making and steps in decision making process; Leadership styles; Social responsibilities of management.

Organizing - Meaning, and features; Process of organization; Principles of organization; Elements of organization; Organization chart; Span of control - Graicunas formulae; Centralisation and decentralization; Types of mechanistic and organic structures of organisation - line organization, line and staff organization, functional organization, committee organization, matrix organization, virtual organisation, cellular organisation, team structure, boundaryless organization, inverted pyramid structure, and lean and flat organization structure; Their merits, demerits and suitability.

**UNIT II**

**Human resources management**

Concepts of HRM; Basic functions of HR manager - human resource planning (definition; objectives; process), recruitment (definition; sources; techniques), selection (definition; process), induction and orientation, training and development (definition; need; methods), employee exit process, employee relations management, employee compensation and benefits administration, job evaluation (objectives; process; methods), and performance appraisals (objectives; process; methods).

**UNIT III**

**Strategic management**

Mission; Goals; Objectives; Policy; Strategy; Programmes; Elements of corporate planning process - environmental scanning; value chain analysis, BCG matrix, generic strategy alternatives, SWOT analysis, and steps in strategy formulation and implementation; Balance score card; Capability maturity model (CMM)/ People capability maturity model(PCMM).

**UNIT IV**

**Operations management**

Plant location; Types of plant layout; Methods of production – job, batch, and mass production; Work study-basic procedure involved in method study and work measurement.

**Materials management**

Objectives; Need for inventory control; EOQ, ABC Analysis; Purchase procedure; Value analysis; JIT, Six sigma; TQM; Supply chain management; Stores management and stores records.

**Marketing**

Functions of marketing; Marketing mix, and marketing strategies based on product life cycle; Channels of distribution.

**UNIT V**

**Project management – network analysis**

Network analysis; Programme evaluation review technique - PERT (probability of completing the project within given time); Critical path method - CPM (Identifying critical path); Project cost analysis; Project crashing; Simple problems.

**TEXT BOOK**


1. Management Science *by* Aryasri; *Publisher: Tata McGraw Hill, 2009.*
2. Principles and Practice of Management - L.M. Prasad; *Publisher: Sultan Chand Publications, New Delhi.*


**REFERENCES**


1. Principles of Marketing: A South Asian Perspective *by* Kotler Philip, Gary Armstrong, Prafulla Y. Agnihotri, and Eshan ul Haque , 2010, 13th Edition, *Publisher: Pearson Education/ Prentice Hall of India*.
2. Management by James Arthur, Finch Stoner, R. Edward Freeman, and Daniel R. Gilbert 6th Ed; Publisher: Pearson Education/Prentice Hall.
3. A Handbook of Human Resource Management Practice *by* Michael Armstrong, 2010; *Publisher: Kogan Page Publishers*.
4. Operations Management: Theory and Practice *by* B. Mahadevan, 2010; *Publisher: Pearson Education*.
5. Strategic Management *by* V.S.P. Rao and V. Hari Krishna, 2010; *Publisher: Excel Books*.

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| **IV Year B.Tech EEE – II sem** | **L** | **T/P/D** | **C** |
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| **Elective-III** | **3** | **0** | **3** |

**(5EE81)HVDC TRANSMISSION**

**Course Prerequisites:**Power Systems, Power Electronics

**Course Objectives:**

- To compare EHV AC and HVDC systems
- To analyze Graetz circuit and also explain 6 and 12 pulse converters
- To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
- To describe various protection methods for HVDC systems and Harmonics

**Course Outcomes**

After completion of this course the student is able to

- Compare EHV AC and HVDC system and to describe various types of DC links
- Analyze Graetz circuit and also explain 6 and 12 pulse converters
- Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
- Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

**UNIT – I**

**BASIC CONCEPTS**

Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trends in D.C. Transmission.

**ANALYSIS OF HVDC CONVERTERS**

Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode – their performance.

**UNIT – II**

**CONVERTER AND HVDC SYSTEM CONTROL**

Principle of DC Link Control, Converters Control Characteristics, Firing angle control, Current and extinction angle control, Effect of source inductance on the system, Starting and stopping of DC link, Power Control.

**REACTIVE POWER CONTROL IN HVDC Transmission**

Introduction, Reactive Power Requirements in steady state, sources of reactive power-Static VAR Compensators, Reactive power control during transients.

**UNIT –III**

**POWER FLOW ANALYSIS IN AC/DC SYSTEMS**

Modelling of DC Links, DC Network, DC Converter, Controller Equations, Solution of DC load flow, P.U. System for DC quantities, solution of AC-DC Power flow-Simultaneous method-Sequential method.

**UNIT-IV**

**CONVERTER FAULTS AND PROTECTION**

Converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, DC breakers, Audible noise, space charge field, corona effects on DC lines, Radio interference.

**UNIT – V**

**HARMONICS**

Generation of Harmonics, Characteristic harmonics, calculation of AC Harmonics, Non-Characteristic harmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics

**FILTERS**

Types of AC filters, Design of Single tuned filters –Design of High pass filters.

**TEXT BOOKS:**


1. HVDC Power Transmission Systems: Technology and system Interactions by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. HVDC Transmission by S K Kamakshaiah, V Kamaraju, TMH Publishers.
3. EHVAC and HVDC Transmission Engineering and Practice by S.Rao, Khanna publications.


**REFERENCES:**


1. HVDC Transmission by Jos Arrillaga, The institution of electrical engineers, IEE power & energy series 29, 2nd edition.
2. Direct Current Transmission by E.W.Kimbark, John Wiley and Sons.
3. Power Transmission by Direct Current by E.Uhlmann, B.S.Publications.

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| **IV Year B.Tech EEE – IISem** | **L** | **T/P/D** | **C** |
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| **Elective-III** | **3** | **0** | **3** |

**(5EC12)VLSI DESIGN**

**(Common for EEE, ECE& EIE)**

**Pre-requisites**

- Electronic Devices and circuits, Digital IC Concepts

**Course Objectives**

- To learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
- To study the concepts of stick diagrams and layouts with the knowledge of MOS layers through designrules.
- To study gate level design of subsystems, integrated circuits
- To learn concepts of PLD's ,design capture tools and CMOS testing.

**Course Outcomes**

**After Completion of the course the student is able to**

- Understand IC Fabrication process steps required for various MOS circuits
- Analyze electrical properties and layout flow for circuit level and gate level models
- Design and test VLSI circuits.

**UNIT I**

**Introduction**

Introduction to MOS Technology – MOS, PMOS, NMOS, CMOS and BiCMOS technologies, fabrication fundamentals: Oxidation, Lithography, Diffusion, Ion implantation, Metallization and Encapsulation.

**Basic Electrical Properties**

Basic Electrical Properties of MOS ,CMOS and BiCMOS Circuits: $I_{DS}$-$V_{DS}$ relationships, MOS transistor threshold Voltage, $g_M$, $g_{DS}$, figure of merit $w_o$, Pass transistor, NMOS inverter, Various pull - ups, Determination of pull-up to pull-down ratio( $Z_{pu}$ / $Z_{pd}$ ) , CMOS Inverter analysis and design, BiCMOS inverters, Latch-up in CMOS circuits.

**UNIT II**

**VLSI Circuit Design Processes**

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layouts, Lambda based design rules, Contact cuts , CMOS Lambda based design rules, Layout Diagrams for logic gates, Transistor structures, wires and vias, Scaling of MOS circuits- Scaling models, scaling factors, scaling factors for device parameters, Limitations of Scaling.

**UNIT III**

**Gate Level Design And Layout**

Architectural issues, Switch logic networks: Gate logic, Alternate gate circuit: Pseudo-NMOS Dynamic CMOS logic. Basic circuit concepts, Sheet Resistance $R_S$ and its concept to MOS,

Area Capacitance Units, Calculations, The delay unit T, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers.

**UNIT IV**

**Subsystem Design**

Subsystem Design, Shifters, Adders, ALUs, Multipliers: Array multiplier, Serial-Parallel multiplier, Parity generator, Comparators, Zero/One Detectors, Up/Down Counter, Memory elements.

**Semiconductor Integrated Circuit Design**

PLDs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Programmable Logic Array Design Approach.

**UNIT V**

**VHDL Synthesis**

VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.

**CMOS Testing**

CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Over view of Chip level Test Techniques and System-level Test Techniques, Layout Design for Improved Testability.

**TEXTBOOKS:**


1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Dougles and A. Pucknell, PHIEdition, 2005.
2. Modern VLSI Design –Wayne Wolf, Pearson Education , 3rd Edition, 1997..


**REFERENCES:**


1. CMOS VLSI Design – A circuits and systems perspective, Neil H.E Weste , David Harris , Ayan Banerjee,pearson ,2009
2. CMOS logic circuit Design – John P. Uyemura , Springer , 2007
3. VLSI DESIGN – K.Lal Kishore , VSV Prabhakar – I.K..International ,2009
4. VLSI Design – A.Albert Raj, Latha PHI, 2008.
5. Introduction to VLSI Design- Mead and Convey , BS Publcations, 2010.
6. VLSI Design – M. Michal Vai, CRC Press, 2009.

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| **IV Year B.Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**Elective-III**

## (5EI81) PROGRAMMABLE LOGIC CONTROLLERS

**Course Prerequisites:** Switching Theory and Logic Design

**Course Objectives:**

- To provide and ensure a comprehensive understanding of using advanced controllers in measurement and control instrumentation.
- To know about data acquisition - process of collecting information from field instruments.
- To analyze Programmable Logic Controller (PLC), IO Modules and internal features, Programming in Ladder Logic, addressing of IO and PID and its Tuning.

**Course Outcomes:**

After completion of this course the student is able to

- Describe the main functional units in a PLC and be able to explain how they interact.
- Know different bus types used in automation industries.
- Develop ladder logic programming for simple process.

**UNIT-I**

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules.

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

**UNIT-II**

Digital logic gates, programming in the Boolean algebra system, conversion examples

Ladder Diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flowchart for spray process system.

**UNIT-III**

PLC Registers: Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

**UNIT-IV**

Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR and Sweep functions and their applications.Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two-axis and three axis Robots with PLC, Matrix functions.

**UNIT-V**

Analog PLC operation: Analog modules and systems, Analog signal processing, Multi bit Data Processing, Analog output Application Examples, PID principles, position indicator with PID control, PID Modules, PID tuning, PID functions.

**TEXT BOOKS:**


1. Programmable Logic Controllers- Principles and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI.
2. Programmable Logic Controllers- Programming Method and Applications by JR.Hackworth and F.D Hackworth Jr., Pearson, 2004.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE – II sem** | **L** | **T/P/D** | **C** |
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**Elective-III**

**(5EE82)RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS**

**Course Prerequisites:** Control Systems, Electrical Distribution Systems and Automation

**Course Objectives:**

- To Describe Rules for combining probabilities of events and Binomial distribution
- To Analyze Series, Parallel, Series-Parallel and Non-series parallel networks
- To Describe Markov models and Frequency and duration concepts
- To apply Reliability concepts for Generation, composite and Distribution systems
- To evaluate basic and performance indices of radial networks.

**Course Outcomes**

After completion of this course the student is able to

- Define Reliability and unreliability and describe Rules for combining probabilities of events
- Define Hazard rate function and derive the expressions for different reliability functions
- Explain Discrete Markov chains and Continuous Markov process
- Apply Reliability concepts for Generation, composite and Distribution systems

**UNIT – I**

**BASICS OF PROBABILITY THEORY AND DISTRIBUTION**

Concepts of Reliability, Unreliability, Availability, Unavailability–Rules for combining probabilities of events – Bernoulli's trials – probability density and distribution functions – binomial distribution – expected value and standard deviation of binomial distribution.

**UNIT – II**

**NETWORK MODELLING AND RELIABILITY ANALYSIS**

Analysis of Series, Parallel, Series-Parallel networks, complex networks: decomposition method, Path based and Cutset based approaches.

**RELIABILITY FUNCTIONS**

Reliability functions f(t), F(t), R(t), h(t) and their relationships – Bath tub curve -exponential distribution – Expected value and standard deviation of exponential distribution –reliability analysis of series, parallel networks using exponential distribution – reliability measures: MTTF, MTTR and MTBF.

**UNIT – III**

**MARKOV MODELLING**

Discrete Markov chains: General modeling concepts-concept of stochastic transitional probability Matrix, Evaluation of limiting state Probabilities, Continuous Markov process: one component repairable model – time dependent probability evaluation using Laplace transform approach – evaluation of limiting state probabilities using STPM – two component repairable models.

**FREQUENCY AND DURATION TECHNIQUES**

Frequency and duration concept – Evaluation of frequency of encountering state, MTTF and MTTR of one, two component repairable models – evaluation of cumulative probability and cumulative frequency of encountering of merged states of two component repairable model.

**UNIT – IV**

**GENERATION SYSTEM RELIABILITY ANALYSIS**

Reliability model of a generation system: recursive relation for unit addition and removal methods, load modeling - Merging of generation load model – evaluation of transition rates, Probability and frequency of failure for merged state model – LOLP, LOLE.

**UNIT – V**

**COMPOSITE SYSTEM RELIABILITY ANALYSIS**

Markov model-Weighted average rate model– Decomposition method – Reliability Indices.

**DISTRIBUTION SYSTEM AND RELIABILITY ANALYSIS**

Basic Concepts – Evaluation of Basic and performance indices of radial networks.

**TEXT BOOKS:**


1. Reliability Evaluation of Engg. System by R. Billinton, R.N.Allan, BS Publications.
2. Reliability Evaluation of Power systems by R. Billinton, R.N.Allan,BS Publications.


**REFERENCES:**


1. Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.
2. An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.
3. Reliability Engineering by E. Balaguruswamy, TMH Publications.
4. Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications.
5. System reliability concepts by V. Sankar, Himalaya Publications.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE –II Sem** | **L** | **T/P/D** | **C** |
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**Elective-IV**

## (5EE83) UTILIZATION OF ELECTRICAL ENERGY

**Course Prerequisites:** Electrical Machines, Circuit Theory

**Course Objectives**

- To make the student familiar with electrical energy and its use when it is converted into several forms of energy.
- To deal with the fundamentals of illumination and its classification and the electric heating and welding.
- To learn the basic knowledge of electric drives.
- To learn the different types of speed time curves in traction system.

**Course Outcomes**

After completion of this course the student is able to

- Know types of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads.
- Describe advantages and methods of electric heating and Electric welding
- Describe existing electric traction systems in India, special features of traction motor and various operating techniques, Speed-time curves for different services and various calculations regarding traction systems.
- Applications of electric drives in traction systems.

**UNIT- I**

**ILLUMINATION**

Illumination: Definitions, types of lighting schemes, Incandescent lamps and fluorescent lamps-polar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, Laws of Illumination-calculations, discharge lamps: Sodium Vapor and Mercury Vapor Lamps, merits of LED Lamps - Illumination Design –Indoor lighting, factory lighting, flood lighting and street lighting-problems.

**UNIT- II**

**HEATING AND WELDING**

Electrical heating-advantages, methods and applications, Resistance heating, design of heating element, efficiency calculations. Induction heating: Core type and Core less furnaces and high frequency eddy current heating, dielectric heating: principle and applications - Problems, Arc furnaces: Direct arc and Indirect arc furnaces-Problems.

Electric welding- types, merits and demerits.

**UNIT - III**

**ELECTRIC DRIVES**

Introduction to Electric vehicle, Types of electric drives, choice of motor, starting and running characteristics, speed control, Methods of Electric Braking: Plugging, Rheostatic and Regenerative Braking. Temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

**UNIT - IV**

**ELECTRIC TRACTION (Part – I)**

Traction Systems: types, Electric traction. Modern 25 KV A.C. single phase traction systems: advantages, equipment and layout of 25 KV single phase A.C. traction system.
Simplified speed time curves, Average and scheduled speed - Quadrilateral and Trapezoidal speed time curves-Problems.

**UNIT - V**

**ELECTRIC TRACTION (Part – II)**

Mechanics of train movement: Adhesive Weight, coefficient of Adhesion, tractive effort and specific energy consumption, factors affecting specific energy consumption-problems.

**TEXT BOOKS:**


1. Utilization of Electric Energy by E. Openshaw Taylor, Orient Longman private limited, 1971.
2. Art & Science of Utilization of electrical Energy by Partab, Dhanpat Rai & Sons.
3. Utilization of Electric Power and Electric Traction by G.C.Garg, Khanna Publishers


**REFERENCES:**


1. Utilization of Electrical Power including Electric drives and Electric traction by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.
3. Utilization of Electrical Power by J.B.Gupta, Kataria publishers.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE –II Sem** | **L** | **T/P/D** | **C** |
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**ELECTIVE-IV**

**(5EE84) FLEXIBLE A.C. TRANSMISSION SYSTEMS**

**Course Prerequisites:** Power Electronics, Power System Analysis and PSOC

**Course Objectives:**

- To understand the fundamentals of FACTS Controllers,
- To know the importance of controllable parameters and types of FACTS controllers & their benefits
- To understand the objectives of Shunt and Series compensation
- To Control STATCOM and SVC and their comparison and the regulation of STATCOM, Functioning and control of GCSC, TSSC and TCSC

**Course Outcomes:**

After completion of this course the student is able to

- Choose proper controller for the specific application based on system requirements
- Understand various systems thoroughly and their requirements
- Understand the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping
- Understand the Power and control circuits of Series Controllers GCSC, TSSC and TCSC

**Unit - I**

**FACTS CONCEPTS**

Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.

**UNIT - II**

**VOLTAGE SOURCE CONVERTERS**

Single phase, three phase full wave bridge converters transformer connections for 12 pulse operation.

Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

**UNIT - III**

**STATIC SHUNT COMPENSATION**

Objectives of shunt compensation, mid point voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators, switching converter type var generators and hybrid var generators.

**UNIT - IV**

**SVC AND STATCOM**

SVC : FC-TCR and TSC-TCR

STATCOM: The regulation and slope.

Comparison between SVC and STATCOM

**UNIT - V**

**STATIC SERIES COMPENSATORS**

Objectives of Series compensation, concept of series capacitive compensation, GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC) control schemes for GSC TSSC and TCSC.

**TEXT BOOKS:**


1. Understanding FACTS Devices by N.G. Hingorani and L. Guygi. IEEE Press Publications 2000.
2. Flexible AC Transmission System by Yong- Hua Song, Allan Johns, IEE Press.


**REFERENCES:**


1. Introduction to FACTS Controllers by Kalyan K.Sen and meyling sen, John wiley & sons, Inc., Hoboken, New Jersey. Mohamed E.EI – Hawary, Series editor.
2. FACTS controllers in power transmission and distribution by K.R Padiyar, Motilal UK Books of India (2007).

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| **IV Year B.Tech EEE – II Sem** | **L** | **T/P/D** | **C** |
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**Elective - IV**

## (5EC14) EMBEDDED REAL TIME OPERATING SYSTEMS
## (Common for EEE, ECE& EIE)

**Pre-requisites**

- Microprocessor and Microcontrollers Concepts

**Course Objectives**

- Learn the general embedded system concepts
- Understand design of embedded hardware and software development tools
- Learn the basics of OS and RTOS
- Describe key issues such as CPU scheduling, memory management, task synchronization, and file system in the context of real-time embedded systems.

**Course Outcomes**

**After Completion of the course the student is able to**

- Understand and design real time and non real time embedded systems
- Define the unique design challenges of real-time systems and program them.
- Understand unique characteristics of RTOS and use RTOS to build an embedded real-time system

**UNIT 1**

**FUNDAMENTALS OF EMBEDDED SYSTEMS**

Definition – Classification of Embedded Systems - Processors in the system - Other Hardware units. Software components - Examples for embedded systems, Design issues and trends

**UNIT 2**

**EMBEDDED HARDWARE DEVELOPMENT ENVIRONMENT**

Processor Architecture- Structured units of a processor - Processor selection factors. Common memory devices - Memory selection - Memory map - Internal devices & I/O devices, Serial devices - Parallel port devices, Timer and Counting devices - Direct memory access, Communication Interface Standards,.

**UNIT 3**

**EMBEDDED SOFTWARE DEVELOPMENT ENVIRONMENT**

Embedded System Development Process, Embedded Operating systems, Types of Embedded Operating systems, Host and Target machines, Linkers/Locators for embedded software, getting embedded software into the target system, Testing on host machine.

**UNIT 4**

**REAL TIME OPERATING SYSTEMS CONCEPTS -I**

Typical OS structure - RTOS structure - The context of its use - Schedule management for multiple tasks - Scheduling in real time - RTOS task scheduling models – Round Robin, Round Robin with Interrupts, Priority driven- Preemptive and Non-preemptive scheduling

**UNIT 5**

**REAL TIME OPERATING SYSTEMS CONCEPTS -II**

Tasks and Task states, Tasks and Data, Semaphores and shared data, Message queues, Mailboxes and Pipes, Timer functions, events, Memory management, Interrupt routines in an RTOS environment.

Case study of RTOS using MUCOS. Case study for RTOS based programming - Coding for Automatic Chocolate vending machine using MUCOS.

**TEXT BOOKS:**


1. An Embedded Software Primer by David E. Simon, Pearson Ed., 2005.
2. Embedded systems - architecture, programming and design by Raj Kamal, Tata McGraw Hill


**REFERENCES:**


1. Real time Systems by J. W. S. Liu, Pearson
2. The 8051 Microcontroller & Embedded Systems using Assembly and C by Ayala & Gadre, Cengage Publications

**VNR Vignana Jyothi Institute of Engineering and Technology**

**IV Year B.Tech EEE – IIsem**

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**Elective-IV**

## (5EE85) SMART ELECTRIC GRID

**Prerequisites:** Power Systems-I, Power Systems-II, Distribution Systems

**Course Objectives:**

- To group various aspects of the smart grid
- To defend smart grid design to meet the needs of a utility
- To select issues and challenges that remain to be solved
- To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulated environment.

**Course Outcomes:**

Upon the completion of the subject, the student will be able to

- Recite the structure of an electricity market in either regulated or deregulated market conditions.
- Understand the advantages of DC distribution and developing technologies in distribution
- Discriminate the trade-off between economics and reliability of an electric power system, differentiate various investment options (e.g. generation capacities, transmission, renewable, demand-side resources, etc) in electricity markets
- Analyze the development of smart and intelligent domestic systems.

### UNIT–I: INTRODUCTION

Introduction to smart grid- Electricity network-Local energy networks- Electric transportation-Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid.

**Smart Grid to Evolve a Perfect Power System:** Introduction- Overview of theperfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems- Fully integrated power system-Nodes of innovation.

### UNIT–II: DC DISTRIBUTION AND SMART GRID

AC vs DC sources-Benefits of and drives of DC power delivery systems-Powering equipment and appliances with DC-Data centers and information technology loads-Future neighborhood-Potential future work and research.

**Intelligrid Architecture for the Smart grid:** Introduction- Launching intelligrid- Intelligrid today- Smart grid vision based on the intelligrid architecture-Barriers and enabling technologies. SCADA, synchro phasors (WAMS)

### UNIT–III: DYNAMIC ENERGY SYSTEMS CONCEPT

Smart energy efficient end use devices-Smart distributed energy resources-Advanced whole building control systems- Integrated communications architecture-Energy management-Role of technology in demand response- Current limitations to dynamic energy management-Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices- Key characteristics of advanced whole building control systems-Key characteristics of dynamic energy management system.

**UNIT–IV: ENERGY PORT AS PART OF THE SMART GRID**

Concept of energy -Port, generic features of the energy port.

**Policies and Programs to Encourage End – Use Energy Efficiency:** Policiesand programs in action -multinational - national-state-city and corporate levels.

**Market Implementation:** Framework-factors influencing customer acceptance andresponse - program planning-monitoring and evaluation.

**UNIT–V: EFFICIENT ELECTRIC END – USE TECHNOLOGY ALTERNATIVES**

Existing technologies – lighting - Space conditioning - Indoor air quality - Domestic water heating - hyper efficient appliances - Ductless residential heat pumps and air conditioners - Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential appliances - Data center energy efficiency- LED street and area lighting - Industrial motors and drives - Equipment retrofit and replacement - Process heating - Cogeneration, Thermal energy storage - Industrial energy management programs - Manufacturing process-Electro-technologies, Residential, Commercial and industrial sectors.

**TEXT BOOKS:**


1. Clark W Gellings, “The Smart Grid, Enabling Energy Efficiency and Demand Side Response”- CRC Press, 2009.
2. Jean Claude Sabonnadiere, NouredineHadjsaid, “Smart Grids”, Wiley-ISTE, IEEE Press, May 2012


**REFERENCES:**


1. JanakaEkanayake, KithsiriLiyanage,Jianzhong.Wu, Akihiko Yokoyama, Nick Jenkins, “Smart Grid: Technology and Applications”- Wiley, 2012.
2. James Momoh, “Smart Grid :Fundamentals of Design and Analysis”-Wiley, IEEE Press, 2012.

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE – IIsem** | **L** | **T/P/D** | **C** |
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## (5EE92) TECHNICAL SEMINAR

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE – IIsem** | **L** | **T/P/D** | **C** |
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## (5EE93) COMPREHENSIVE VIVA

**VNR Vignana Jyothi Institute of Engineering and Technology**

| **IV Year B.Tech EEE – II sem** | **L** | **T/P/D** | **C** |
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## (5EE94) PROJECT WORK