# VINAYAKA MISSIONS UNIVERSITY

SALEM, INDIA

**FACULTY OF ENGINEERING AND TECHNOLOGY**

## REGULATION -2012

**CURRICULUM AND SYLLABUS**
**FROM**
**I TO VIII SEMESTERS**
**FOR**

**B.E.ELECTRICAL AND ELECTRONICS ENGINEERING [REGULAR)**

## SEMESTER I

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | English for Effective Communication | English | 3 | 0 | 0 | 3 |
| 2. | | Engineering Mathematics I | Mathematics | 3 | 0 | 1 | 4 |
| 3. | | Computer Foundation Program | CSE | 3 | 0 | 0 | 3 |
| 4. | | Environmental Science & Engineering | Chemistry | 3 | 0 | 0 | 3 |
| 5. | | Engineering Physics | Physics | 3 | 0 | 0 | 3 |
| 6. | | Basic Civil & Mechanical Engineering<br>a) Civil Engineering<br>b) Mechanical Engineering | Civil<br>Mechanical | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 7. | | Engineering Physics Lab | Physics | 0 | 0 | 4 | 2 |
| 8. | | Workshop Practice | Mechanical | 0 | 0 | 4 | 2 |
| 9. | | Computer Foundation Program Lab | CSE | 0 | 0 | 4 | 2 |
| | | **TOTAL** | | **18** | **0** | **13** | **25** |

## SEMESTER II

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Business English | English | 3 | 0 | 0 | 3 |
| 2. | | Engineering Mathematics II | Mathematics | 3 | 0 | 1 | 4 |
| 3. | | Engineering Chemistry | Chemistry | 3 | 0 | 0 | 3 |
| 4. | | Programming in C | CSE | 3 | 0 | 0 | 3 |
| 5. | | Basic Electrical & Electronics Engineering<br>a) Electrical Engineering<br>b) Electronics Engineering | EEE<br>ECE | 3 | 0 | 0 | 3 |
| 6. | | Nano Science and Technology | EEE | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 7. | | Engineering Chemistry Lab | Chemistry | 0 | 0 | 4 | 2 |
| 8. | | Basic Electrical & Electronics Engineering Lab<br>a) Electrical Engineering Lab<br>b) Electronics Engineering Lab | EEE<br>ECE | 0 | 0 | 4 | 2 |
| 9. | | Engineering Graphics Lab | Mechanical | 0 | 0 | 4 | 3 |
| | | **TOTAL** | | **18** | **0** | **13** | **26** |

## SEMESTER III

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Advanced Engineering Mathematics | Mathematics | 3 | 1 | 0 | 4 |
| 2. | | Electronic Devices | ECE | 3 | 0 | 0 | 3 |
| 3. | | Electric Circuit Analysis | EEE | 3 | 1 | 0 | 4 |
| 4. | | Electrical Machines -I | EEE | 3 | 0 | 0 | 3 |
| 5. | | Power Plant Engineering | Mechanical | 3 | 0 | 0 | 3 |
| 6. | | Object Oriented Programming | CSE | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 7. | | Electric Circuits & Electronic Devices Lab | EEE | 0 | 0 | 4 | 2 |
| 8. | | Electrical Machines Lab-I | EEE | 0 | 0 | 4 | 2 |
| 9. | | Object Oriented Programming Lab | CSE | 0 | 0 | 4 | 2 |
| | | **TOTAL** | | **18** | **2** | **12** | **26** |

## SEMESTER IV

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Numerical Methods | Mathematics | 3 | 0 | 2 | 4 |
| 2. | | Transmission and Distribution | EEE | 3 | 1 | 0 | 4 |
| 3. | | Electrical Machines-II | EEE | 3 | 0 | 0 | 3 |
| 4. | | Electro Magnetic Theory | EEE | 3 | 1 | 0 | 4 |
| 5. | | Electronic Circuits | ECE | 3 | 0 | 0 | 3 |
| 6. | | Digital Electronics | ECE | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 7. | | Electrical Machines Lab -II | EEE | 0 | 0 | 4 | 2 |
| 8. | | Electronic Circuits & Digital Electronics Lab | ECE | 0 | 0 | 4 | 2 |
| 9. | | Professional Communication and Personality Development | | 0 | 0 | 2 | 1 |
| | | **TOTAL** | | **18** | **2** | **12** | **26** |



## SEMESTER V

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Power Electronics | EEE | 3 | 0 | 0 | 3 |
| 2. | | Control Systems | EEE | 3 | 1 | 0 | 4 |
| 3. | | Embedded systems | ECE | 3 | 0 | 0 | 3 |
| 4. | | Linear Integrated Circuits | ECE | 3 | 1 | 0 | 4 |
| 5. | | Data Structures | CSE | 3 | 0 | 0 | 3 |
| 6. | | Elective - I | | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 7. | | Power Electronics Lab | EEE | 0 | 0 | 4 | 2 |
| 8. | | Control Systems Lab | EEE | 0 | 0 | 4 | 2 |
| 9. | | Linear Integrated Circuits Lab | ECE | 0 | 0 | 4 | 2 |
| | | **TOTAL** | | **18** | **2** | **12** | **26** |

## SEMESTER VI

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Measurement and Instrumentation | EEE | 3 | 0 | 0 | 3 |
| 2. | | Microprocessors & Microcontrollers | ECE | 3 | 0 | 0 | 3 |
| 3. | | Fundamentals of Digital Signal Processing | ECE | 3 | 1 | 0 | 4 |
| 4. | | Power System Analysis | EEE | 3 | 1 | 0 | 4 |
| 5. | | Mathematical Modelling and Simulation | EEE | 3 | 0 | 0 | 3 |
| 6. | | Elective-II | | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 7. | | Measurement and Instrumentation Lab | EEE | 0 | 0 | 4 | 2 |
| 8. | | Microprocessors & Microcontrollers Lab | ECE | 0 | 0 | 4 | 2 |
| 9. | | Mathematical Modelling and Simulation Lab | EEE | 0 | 0 | 4 | 2 |
| | | **TOTAL** | | **18** | **2** | **12** | **26** |

## SEMESTER VII

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Power System Operation and Control | EEE | 3 | 0 | 0 | 3 |
| 2. | | High Voltage Engineering | EEE | 3 | 1 | 0 | 4 |
| 3. | | Solid State Drives | EEE | 3 | 1 | 0 | 4 |
| 4. | | Protection and Switch Gear | EEE | 3 | 0 | 0 | 3 |
| 5. | | Engineering Management & Ethics | MGMT | 3 | 0 | 0 | 3 |
| 6. | | Elective-III | | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 7. | | Mini Project | EEE | 0 | 0 | 3 | 2 |
| 8. | | Power System Simulation Lab | EEE | 0 | 0 | 4 | 2 |
| 9. | | Comprehension | EEE | 0 | 0 | 2 | 1 |
| | | **TOTAL** | | **18** | **2** | **9** | **25** |

## SEMESTER VIII

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Elective -IV | | 3 | 0 | 0 | 3 |
| 2. | | Elective-V | | 3 | 0 | 0 | 3 |
| 3. | | Elective-VI | | 3 | 0 | 0 | 3 |
| | **PRACTICAL** | | | | | | |
| 4. | | Project Work & Viva Voce | EEE | 0 | 0 | 12 | 6 |
| | | **TOTAL** | | **9** | **0** | **12** | **15** |

**TOTAL CREDITS :144**

**FIRST YEAR CREDITS : 51**

**TOTAL :195**



## ELECTIVES

| Sl.No | Course Code | Course Title | Dept. Offering the course | L | T | P | C |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1. | | Advanced Control System | EEE | 3 | 0 | 0 | 3 |
| 2. | | Advanced Topics in Power Electronics | EEE | 3 | 0 | 0 | 3 |
| 3. | | Artificial Intelligence and Expert System | EEE | 3 | 0 | 0 | 3 |
| 4. | | Biomedical Instrumentation | EEE | 3 | 0 | 0 | 3 |
| 5. | | CAD for Electrical Apparatus | EEE | 3 | 0 | 0 | 3 |
| 6. | | Computer Architecture | CSE | 3 | 0 | 0 | 3 |
| 7. | | Design of Electrical Apparatus | EEE | 3 | 0 | 0 | 3 |
| 8. | | EHV AC & Direct Current Power Transmission | EEE | 3 | 0 | 0 | 3 |
| 9. | | Flexible AC Transmission System | EEE | 3 | 0 | 0 | 3 |
| 10. | | High Voltage Direct Current Transmission | EEE | 3 | 0 | 0 | 3 |
| 11. | | Information Security | CSE | 3 | 0 | 0 | 3 |
| 12. | | Intelligent Controllers | ECE | 3 | 0 | 0 | 3 |
| 13. | | MEMS | ECE | 3 | 0 | 0 | 3 |
| 14. | | Power Electronics for Renewable Energy System | EEE | 3 | 0 | 0 | 3 |
| 15. | | Power Quality | EEE | 3 | 0 | 0 | 3 |
| 16. | | Power system Planning and Reliability | EEE | 3 | 0 | 0 | 3 |
| 17. | | Power System Transients | EEE | 3 | 0 | 0 | 3 |
| 18. | | Principles of Communication Engineering | ECE | 3 | 0 | 0 | 3 |
| 19. | | Robotics and Automation | ECE | 3 | 0 | 0 | 3 |
| 20. | | Special Electrical Machines | EEE | 3 | 0 | 0 | 3 |
| 21. | | VLSI Design Techniques | ECE | 3 | 0 | 0 | 3 |
| 22. | | Wind Energy Conversion Systems | EEE | 3 | 0 | 0 | 3 |
| **INDUSTRIAL ELECTIVES** | | | | | | | |
| 23. | | Learning IT Essentials by doing | Infosys | 3 | 0 | 0 | 3 |
| 24. | | Business Intelligence and its Applications | Infosys | 3 | 0 | 0 | 3 |
| 25. | | Virtual Instrumentation | National Instruments | 3 | 0 | 0 | 3 |

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 3 | 0 | 0 | 3 |

## ENGLISH FOR EFFECTIVE COMMUNICATION

## (COMMON TO ALL BRANCHES)

UNIT - I 9

Word formation with prefixes and suffixes, Antonyms & Synonyms-Tense Forms - Different kinds of Nouns and Pronouns - Use of Verbs and Adverbs - Adjectives - Sentence Pattern (SVOCA) - Conditional Sentences - Auxiliary and Modal verbs - Articles.

**UNIT - II 9**

Phonetics (Vowels, Consonants and Diphthongs) - Pronunciation Guidelines - Vocabulary (Homophones).

**UNIT - III 9**

Principles of Communication - Defining and Describing Objects - Listening for Information and Making Inferences - Understanding Ideas and Making Inferences.

**UNIT - IV 9**

How to write reports, report writing - Recommendations - Discussing data and coming to conclusions - Rearranging the jumbled sentences.

**UNIT - V 9**

Skimming - Scanning - Flowcharts - Pie-charts - Formal and Informal letters - Resume Writing.

**Total: 45 hours**

**TEXT BOOK**

1. English for Effective Communication, Departments of English, VMKV & AVIT. Erode: SCM Publishers, 2009.



REFERENCE BOOKS

1. M.Ashraf Rizvi, Effective Technical Communication. New Delhi: Tata McGraw Hill Publications, 2007.

2. Pickett and Laster. Technical English: Writing, Reading and Speaking. New York: Harper and Row Publications, 2002.

3. Cutts, Martin. The Plain English Guide - How to Write Clearly and Communicate Better. New Delhi: Oxford University Press, 1995.

4. Narayanaswami.V.R. Strengthen Your Writing. Chennai: Orient Longman Ltd., 1996.

5. Prof.K.R.Lakshmi Narayanan & Dr.T.Murugavel, Communication Skills for Engineers, Chennai: SCI Publications, 2002.

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 3 | 0 | 1 | 4 |

## ENGINEERING MATHEMATICS-I

**(Common to MECH, ECE, CSE, CSSE, EEE, EIE, CIVIL, IT, MECHTRONICS, AERONAUCTICAL, ETC & AUTOMOBILE)**

### UNIT I - MATRICES 9

Characteristic equation - Eigen values and eigenvectors of a real matrix - Properties of eigenvalues and eigenvectors (Without proof) - Cayley-Hamilton theorem (excluding proof) - Orthogonal transformation of a symmetric matrix to diagonal form.

### UNIT II - DIFFERENTIAL CALCULUS 9

Curvature - Cartesian and Parametric Co-ordinates - Centre and radius of curvature - Circle of curvature - Evolute

### UNIT III - FUNCTIONS OF SEVERAL VARIABLES 9

Partial Derivatives - Total Differential - Maxima and Minima - constrained Maxima and Minima by Lagrangian Multiplier Method.

### UNIT IV - LAPLACE TRANSFORMS 9

Laplace transform - transform of elementary functions - basic properties - derivatives and integrals of transforms - transforms of derivatives and integrals - initial and final value theorems - Transform of periodic functions.

### UNIT V - APPLICATIONS OF LAPLACE TRANSFORMS 9

Inverse Laplace transform - Convolution theorem - Initial and Final value theorem-Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transforms.

**Total hours : 60**

**Lecture Hours : 45**



**Tutorial Hours : 15**

### TEXT BOOKS

1. "Engineering Mathematics-I" by Department of Mathematics, VMU

2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.

3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

### REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers, Delhi 2001.

2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.

3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics",

4. Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001.

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 3 | 0 | 0 | 3 |

## COMPUTER FOUNDATION PROGRAM

## (COMMON TO ALL BRANCHES)

**UNIT I - Basics of Computer and Information Technology 9**

Digital computer fundamentals-Block diagram of a computer-component of a computer system Hardware and software definitions-Categories of software-Booting-Installing and Uninstalling Software-Software piracy-Software terminologies-Application of Computer-Role of Information Technology-History of Internet-Internet Services.

**UNIT II - Problem Solving Methodologies and Techniques 9**

Problems solving Techniques-Program development cycle-Algorithm-Design-Flow chart-Program control structures-Types and generation of programming languages-Development of algorithms for simple problems. Top down and Bottom up approaches of software development.

**UNIT III - Basics of Computer Architecture and System Software 9**

Fundamentals of Computer Architecture-Introduction-Organization of a small computer Central Processing Unit-Execution cycle-Instruction categories - measure of CPU performance Memory-Input/output devices-BUS-addressing modes.

System Software-Assemblers-Loaders and linkers-Compilers and interpreters.

**UNIT IV - Basics of Operating System and DBMS 9**

Introduction-Basics of memory management schemes-Sched-



uling-threads. Introduction to File and Database systems- SQL-DDL statements-DML statements-DCL statements.

**UNIT V - Software Applications 9**

Office Automation: Application Packages-word processing-Spread sheet Application and Basics of HTML.

**Total: 45 hours**

**REFERENCES**

1. Ashok N.Kamthane, programming with ANSI and TURBO C, Pearson Education (India) 2005.

2. V.Ramesh babu, fundamental of computing, VRB publisher, 2004.

3. Carl Hamacher, Zvonko Varnesie and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill, 2002.

4. Leland L.Beck, "System Software- An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2000.

5. Abraham Silberschatz, Peter Baer Galvin and Greg Gange, "Operating System Concepts", Sixth Edition, John Wiley & Sons Pvt. Ltd,2003.

6. Abraham Silberschatz, Henry F.Korth and S.Sudarshan - "Da-

tabase Systems Concepts", Fourth Edition, McGraw-Hill, 2002.

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 3 | 0 | 0 | 3 |

## ENVIRONMENTAL SCIENCE AND ENGINEERING

## (COMMON TO ALL BRANCHES)

### UNIT - I - ENVIRONMENT AND NATURAL RESOURCES 9

Environment - Definition , scope & importance - Public awareness - Forest resources , mineral resources , water resources, food resources , energy resources (uses, over -exploitation & adverse effects in each case) - Scope & role of environmental engineers in conservation of natural resources - Sustainability development.

### UNIT - II - ECOSYSTEMS AND BIO - DIVERSITY9

Ecosystem - Definition, structure and function - Energy flow - Ecological succession - food chain, food web, ecological pyramids - Introduction, types, characteristics, structure and function of forest, grassland, desert and Aquatic ecosystems - Bio - Diversity : values and uses, hotspots, threats and conservation.

### UNIT - III - ENVIRONMENTAL POLLUTION 9

Pollution - Definition , man made impacts and control measures of air, water and land pollution - Water quality standards & characterization - Importance of sanitation -Nuclear hazards - Hazardous waste management : Solid waste, waste water and biomedical waste - Prevention of pollution and role of individual - Disasters management : Floods, earthquake, cyclone and land slides - Clean technology options.

### UNIT - IV - SOCIAL ISSUES AND ENVIRONMENT 9

Urban problems related to energy - Water conservation - Resettlement and rehabilitation of people - Environmental ethics -



Climate change - Global warming - Acid rain - Ozone depletion- Waste land reclamation , Environment Protection Act for air, water , wild life and forests - Pollution Control Board.

### UNIT - V - HUMAN POPULATION AND ENVIRONMENT 9

Population growth - Population explosion - Family welfare programme - Environment & human health - Human rights - Value education - Women and child welfare, Role of information technology in environment and human health.

**Total: 45 hours**

### TEXT BOOKS :

1. Environmental Science and Engineering by Dr. J. Meenambal , MJP Publication , Chennai Gilbert M. Masters : Introduction to Environmental Engineering and Science , Pearson Education Pvt Ltd., II Edition, ISBN 81-297-0277-0, 2004

2. Miller T.G. Jr Environmental Science Wadsworth Publishing Co.

3. Townsend C. Harper J. and Michael Begon, Essentials of Ecology, Blackwell Science.

### REFERENCES :

1. Wager K.D. "Environmental Management", W.B. Saunders Co. Philadelphia, USA, 1998.

2. Bharucha Erach "The Biodiversity of India" Mapin Publishing Pvt Ltd, Ahmedabad, India

3. Trivedi R.K. " Handbook of Environmental Laws", Rules, Guidelines, Compliances and Standards Vol I & II, Enviro media.

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 3 | 0 | 0 | 3 |

## ENGINEERING PHYSICS

## (COMMON TO ALL BRANCHES)

### UNIT - I LASERS 9

Einstein coefficients (A&B), Nd - YAG laser, CO2 laser, semi-conductor laser (homojunction) - uses of lasers - Holography - construction and reconstruction of a hologram.

### UNIT - II FIBRE OPTICS 9

Principle and propagation of light in optical fibres - numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) - Applications: Fibre optic communication system (block diagram only) - fibre optic sensors (displacement sensor and pressure sensor).

### UNIT - III CRYSTAL PHYSICS 9

Lattice - unit cell - Bravais lattice - Lattice planes - Miller indices - "d? spacing in cubic lattice - calculation of number of atoms per unit cell - atomic radius - coordination number - packing factor for SC, BCC, FCC, HCP structures.

### UNIT - IV ACOUSTICS 9

Classification of sound - characteristics of musical sound - loudness - Weber-Fechner law - decibel - absorption coefficient - experimental determination - reverberation - reverberation time - Sabine?s formula (no derivation) - factors affecting acoustics of buildings (reverberation time, loudness, focusing, echo, echolen effect, resonance and noise) and their remedies.

### UNIT- V NON - DESTRUCTIVE TESTING 9

Liquid penetrant method - ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography: displacement method - X-ray Fluoroscopy - merits and demerits of each method.



**Total: 45 hours**

### TEXT BOOK

1. "Engineering Physics" Complied by Vinayaka Missions University, Salem

### REFERENCE BOOKS

1. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai publishers, New Delhi, 2001.

2. Rajendran. V, "Engineering Physics", Tata Mc Graw Hill Publication and Co New Delhi, 2009.

3. Pillai S.O "Solid State Physics", New Age International Publication, New Delhi, (2003).

4. Palanisamy P.K. "Physics for Engineers", SciTech publications (India) Pvt. Ltd., Chennai (2005).

5. Rajendran V and Marikani "Physics for Engineers", Tata McGraw Hill Publishing Company Ltd, New Delhi (2004).

6. Arumugam M, "Engineering Physics", Anuradha Agencies, Kumbakonam, Second Edition (2005).

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 3 | 0 | 0 | 3 |

## BASIC CIVIL & MECHANICAL ENGINEERING (COMMON TO ECE, EIE, EEE, ETC, CSE, IT, CSSE, MECT& BME)

### a) CIVIL ENGINEERING

**UNIT - I : SURVEYING AND CIVIL ENGINEERING MATERIALS 8**

Surveying: Objects - types - classification - principles - measurements of distances - angles - Levelling - determination of areas - illustrative examples. Civil Engineering Materials: Bricks - stones - sand - cement - concrete - steel sections.

**UNIT-II: BUILDING COMPONENTS AND STRUCTURES 8**

Foundations: Types, Bearing capacity - Requirement of good foundations. Superstructure: Brick masonry - stone masonry - beams - columns - lintels - roofing - flooring - plastering -Types of Bridges and Dams - Basics of Interior Design and Landscaping.

**UNIT-III: BASICS OF ENGINEERING MECHANICS 7**

Mechanics - Internal and external forces - stress - strain - elasticity - Centroid - Centre of Gravity - Simple problems - Moment of Inertia - Simple Problems.

### b) MECHANICAL ENGINEERING

**UNIT-IV: POWER PLANT ENGINEERING 8**

Introduction, Classification of Power Plants - Working principle of steam, Gas, Diesel, Hydroelectric and Nuclear Power plants - Merits and Demerits - Pumps and turbines - working principle of Reciprocating pumps (single acting and double acting) - Centrifugal Pump.



**UNIT-V: IC ENGINES 8**

Internal combustion engines as automobile power plant - Working principle of Petrol and Diesel Engines - Four stroke and two stroke cycles - Comparison of four stroke and two stroke engines - Boiler as a power plant.

**UNIT-VI : REFRIGERATION AND AIR CONDITIONING SYSTEM 7**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system - Layout of typical domestic refrigerator - Window and Split type room Air conditioner.

**TOTAL: 46 PERIODS**

**REFERENCES:**

1. Shanmugam G and Palanichamy M S, "Basic Civil and MechanicalEngineering", Tata McGraw Hill Publishing Co., New Delhi, (1996).

2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).

3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).

4. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).

5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 0 | 0 | 4 | 2 |

## ENGINEERING PHYSICS LAB

## (COMMON TO ALL BRANCHES)

**List of Experiments**

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines - grating - Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire - Potentiometer



YEAR I L T P C
SEMESTER I 0 0 4 2

## WORKSHOP PRACTICE

## (COMMON TO MECH, ECE, CSE, CSSE, EEE, EIE, CIVIL, IT, MECHTRONICS, AERONAUCTICAL,ETC & AUTOMOBILE)

**FITTING**

1. Vee Joint
2. Square Joint
3. Dove Tail Joint

**CARPENTRY**

1. Planning
2. Half lab
3. Dove Tail Joint

**WELDING**

1. Arc Welding of butt Joint.

2 Arc Welding of Lap Joint

**DEMONSTRATION**

1. Sheet Metal - Fabrication of tray and cone
2. Black Smithy - Round to square rod.
3. Foundry - Mould Preparation using single piece and split pattern

**REFERENCE**

1. "Basic Workshop Practice ", Department of Mechanical Engineering, VMKV Engineering College, 2008

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER I | 0 | 0 | 4 | 2 |

## COMPUTER FOUNDATION PROGRAM LAB

## (COMMON TO ALL BRANCHES)

### I. OFFICE AUTOMATION

1. Create a document with all formatting effects.

2. Create a document to send mails using mail merge option.

3. Create an Excel File to analyze the student?s performance. Create a chart for the above data to depict it diagrammatically.

4. Create Excel sheet to maintain employee information and use this data to send mails using mail merge.

5. Create a Power Point presentation for your personal profile with varying animation effects with timer.

### II. SQL QUERIES

1. Write SQL Commands for Data Definition, Table Creation with constraints.

2. Write SQL Commands for Insert, Select, Update and Delete operations.

3. Write SQL Commands for aggregate functions.

### III. HTML

1. Write HTML code to develop a web page having the background in red and title "My First Page" in any other color.

2. Design a page having background color given text color red and using all the attributes of font tab.

3. Create a web page, when user clicks on the link it should go to the bottom of the page.



4. Create a web page, showing an ordered & unordered list of name of your five friends.

5. Create a web page with appropriate content and insert an image towards the left hand side of the page when user clicks on the image. It should open another web page.

6. Create a web page which should contain a table having two rows and two columns.

| YEAR I | L | T | P | C |
|---|---|---|---|---|
| SEMESTER II | 3 | 0 | 0 | 3 |

## BUSINESS ENGLISH

## (COMMON TO ALL BRANCHES)

**UNIT - I** **9**

Subject and Verb Agreement (Concord) - Active and Passive Voice, Impersonal Passive Voice - Preposition - Common Errors - Direct Speech and Indirect Speech - Cause and Effect - Phrasal Verbs and Idioms and Phrases - Question Tags - Vocabulary.

**UNIT - II** **9**

Stress (Word Stress and Sentence Stress) - Intonation - Differences in British and American English - Indianism.

**UNIT - III** **9**

Role Play - Telephonic Etiquettes - Interview Questions (Direct, Open-ended and Closed Questions) - E-mail Netiquette, Sample E-mails.

**UNIT - IV** **9**

Instruction - Check-list - Minutes of the Meeting and Writing Agenda - Note making.

**UNIT - V** **9**

Reading Comprehension - Interpreting Tables - Bar charts - Business Letters (Calling for Quotation, Placing Orders and Complaint Letters) - Essay Writing and Developing Hints.

**Total: 45 hours**

**TEXT BOOK**

1. English for Effective Communication, Departments of English, VMKV & AVIT. Erode: SCM Publishers, 2009.



**REFERENCE BOOKS**

1. M.Ashraf Rizvi, Effective Technical Communication. New Delhi: Tata McGraw Hill Publications, 2007.

2. Pickett and Laster. Technical English: Writing, Reading and Speaking. New York: Harper and Row Publications, 2002.

3. Cutts, Martin. The Plain English Guide - How to Write Clearly and Communicate Better. New Delhi: Oxford University Press, 1995.

4. Narayanaswami.V.R. Strengthen Your Writing. Chennai: Orient Longman Ltd., 1996.

5. Prof.K.R.Lakshmi Narayanan & Dr.T.Murugavel, Communication Skills for Engineers, Chennai: SCI Publications, 2002.

| YEAR I | L | T | P | C |
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| SEMESTER II | 3 | 1 | 0 | 4 |

## ENGINEERING MATHEMATICS - II (COMMON TO MECH,ECE,CSE, CSSE, EEE, EIE, CIVIL, IT, MECHTRONICS, AERONAUCTICAL , ETC & AUTOMOBILE)

### UNIT I - ORDINARY DIFFERENTIAL EQUATIONS 9

Solutions of third and higher order linear ordinary differential equation with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients.

### UNIT II - MULTIPLE INTEGRALS 9

Double integration -change of order of integration- Cartesian and polar coordinates -Area as a double integral - Triple integration - volume as a triple integral.

### UNIT III - VECTOR CALCULUS 9

Directional derivatives - Gradient, Divergence and Curl - Irrotational and solenoidal- vector fields - vector integration - Green's theorem, Gauss divergence theorem and Stoke's theorem (excluding proof).

### UNIT IV - ANALYTIC FUNCTIONS 9

Function of a complex variable - Analytic function - Necessary conditions - Cauchy Riemann equations - Sufficient conditions (excluding proof) - Harmonic conjugate-Constructions of analytic functions-conformal mapping(w=z+c,w=z2,w=1/z)-bilinear transformation

### UNIT V - COMPLEX ANALYSIS 9

Statement and application of Cauchy's integral theorem and integral formula - Taylor's and Laurent's expansions -Residues - Cauchy's residue theorem-contour integration over unit circle.



**Total hours: 60**

**Lecture Hours: 45**

**Tutorial Hours: 15**

### TEXT BOOKS

1. "Engineering Mathematics-II" by Department of Mathematics, VMU

2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.

3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

### REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers,Delhi 2001.

2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.

3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics",Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001

| YEAR I | | L | T | P | C |
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| SEMESTER | II | 3 | 0 | 0 | 3 |

## ENGINEERING CHEMISTRY
## (COMMON TO ALL BRANCHES)

### UNIT I - WATER TECHNOLOGY & CORROSION 9

Sources of water - impurities - Hardness and its determination (problems to be avoided) - boiler troubles - water softening (zeolite & Demineralisation) - Domestic water treatment - Desalination (Electrodialysis & Reverse Osmosis). Corrosion - Types - principles - corrosion control methods (Sacrificial and Impressed current method).

### UNIT II - ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS 9

Ostwald Law and Debye Huckle's law - Cells - Electrode (SHE, Calomel and Glass) - Electrode potential - Nernst equation - EMF series. Primary cells - secondary batteries - charging and discharging.

### UNIT III - CHEMISTRY OF ADVANCED MATERIALS 9

Portland cement -setting and hardening - RCC - Special cements. Organic electronic material, solid oxide materials, shape memory alloys, nanomaterials, polymers, fullerenes, ceramics, fibers, lubricants, refractories & composites (definition, classification and applications)

### UNIT IV - PHASE EQUILIBRIA & NUCLEAR CHEMISTRY 9

Phase rule: statement and explanation of terms involved - One component system - Condensed phase rule - Two component system. Nuclear Chemistry - Fission - Fusion - working of nuclear reactor - Radiations and harmful effects.



### UNIT V - CHROMATOGRAPHY AND SPECTROSCOPY 9

Chromatography -- classification & principles (Paper, column, thin layer, gas, HPLC). Spectroscopy - Electromagnetic radiation - Beer Lambert's law - UV - Visible - IR (Principle and Instrumentation, block diagram) - Atomic absorption spectroscopy.

**Total: 45 hours**

**Text Book:**

1. Engineering Chemistry by Jain & Jain,15th Edition, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

**Reference Book:**

1. A Text Book of Engineering Chemistry by Shashi Chawla, Edition 2012,Dhanpat Rai & Co, New Delhi.

2. A Text Book of Engineering Chemistry by S.S.Dara, S.Chand & Company Ltd, New Delhi.

3. Engineering Chemistry by Dr.Ravikrishna, Krishna Publications, Chennai.

| YEAR I | | L | T | P | C |
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## PROGRAMMING IN C

## (COMMON TO ALL BRANCHES)

### UNIT I 9

Introduction: Algorithms & flowcharts-Overview of C-Features of C-IDE of C Structure of C program-Compilation & execution of C program-Identifiers, variables, expression, keywords, data types, constants, scope and life of variables, local and global variables. Operators: arithmetic, logical, relational, conditional and bitwise operators- Special operators: size of () & comma (,) operator-Precedence and associativity of operators & Type conversion in expressions.

Basic input/output and library functions: Single character input/output i.e. getch(), getchar(), getche() & putchar()-Formatted input/output: printf() and scanf()-Library Functions: concepts, mathematical and character functions.

### UNIT II 9

Control structures: Conditional control-Loop control and Unconditional control structures. Functions: The Need of a function-User defined and library function- Prototype of a function-Calling of a function-Function argument-Passing arguments to function-Return values-Nesting of function- main()-Command line arguments and recursion. Storage class specifier - auto, extern, static, & register.

### UNIT III 9

Arrays: Single and multidimensional arrays-Array declaration and initialization of arrays-Array as function arguments. Strings: Declaration-Initialization and string handling functions. Structure and Union: Defining structure-Declaration of structure variable-Accessing structure members-Nested structures-Array of structures-Structure assignment-Structure as function argument-Function that returns structure- Union.



### UNIT IV 9

Pointers: The "&? and * operators-Pointers expressions-Pointers vs arrays-Pointer to functions-Function returning pointers-Static and dynamic memory allocation in C. DMA functions: malloc(), calloc(), sizeof(), free() and realloc()-Preprocessor directives.

### UNIT V 9

File management: Defining, opening & closing a file, text file and binary file- Functions for file handling: fopen,fclose, gets, puts, fprintf, fscan, getw, putw, fputs, fgets, fread, fwrite-Random access to files: fseek, ftell, rewind-File name as Command Line Argument.

**Total: 45 hours**

### TEXT BOOKS :

1. Balaguruswami.E, "Programming in C?, TMH Publications,1997

### REFERENCE BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg, "Computer Science A Structured Programming using C", Cengage Learning, 3rd Edition, 2007

2. Gottfried , "Programming with C?, schaums outline series, TMH publications,1997

3. Mahapatra , "Thinking in C?, PHI publications, 2nd Edition, 1998.

4. Stevens , "Graphics programming in C?, BPB publication, 2006

5. Subbura.R , "Programming in C?, Vikas publishing, 1st Edition,

| YEAR I | L | T | P | C |
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## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (COMMON TO ECE, ETCE, MECHT, BME, BT, BF, EEE, EIE, CSE, IT, CSSE AND CIVIL)

### a) ELECTRICAL ENGINEERING

**UNIT I** **8**

**Electrical Circuits & Meters**

Definition of electromotive force, current, power and energy-International System of units-Ohm's law and Kirchhoff's laws-solution of series and parallel Circuits. Generation of alternating voltage-average and RMS values-solution of simple R,RL,RC and RLC circuits- Calculation of power and power factor in AC circuits. Construction and principles of operation of moving coil, moving iron and dynamometer instruments.

**UNIT II** **8**

**DC Machines (Qualitative Treatment Only)**

Dc machines -parts-DC generator-EMF equation-Different types of DC generators and their applications-DC motors and their applications-different types -speed control-Starters.

**UNIT III** **7**

**AC Machines (Qualitative Treatment Only)**

Construction & principle of operation of transformers-Single phase & Three phase transformers-Construction and operation of AC motors-Single phase and three phase Induction motors-applications-construction, principles of operation and application of synchronous motors.



### b) ELECTRONICS ENGINEERING

**UNIT I: SEMICONDUCTOR DEVICES AND APPLICATIONS** **8**

Passive and Active Components - Resistors, Inductors, Capacitors, Characteristics of PN Junction Diode - Zener Effect - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor - CB, CE, CC Configuration and Characteristics.

**UNIT II : FUNDAMENTALS OF COMMUNICATION ENGINEERING** **8**

Types of Signals: Analog and Digital Signals - Modulation and Demodulation: Principles of Amplitude Modulation, Angle Modulation, Pulse Amplitude Modulation, Pulse Width Modulation and Pulse Code Modulation Communication Systems: Radio, High DefinitionTV, MODEM, Fax, Microwave, Radar, Satellite and Optical Fibre, Mobile-Cellphones (block diagram description only).

**UNIT III : STUDY OF ADVANCED ELECTRONIC GADGETS** **7**

High Definition Camera,High Definition Video Camera,Tablet PC,Android Phones,i pods,Video Game Consoles

**Total: 46 hours**

**TEXT BOOKS**

1. "Basic Electrical and Electronics Engineering", R.K. Rajput Laxmi Publications Pvt. Ltd., 2nd Edition.

**REFERENCES**

1. "Basic Electrical and Electronics Engineering", compiled by Department of EEE&ECE faculty of Engineering & technology, VMRFDU, Anuradha Agencies, 2006.

2. Edward Hughes, "Electrical and Electronics Technology", Pearson Education Limited, Ninth edition,2005.

3. "Basic Electrical and Electronics Engineering", Compiled by Department of EEE & ECE, Faculty of Engineering and Technology, VMRFDU, Anuradha agencies,2006.

4. B.R. Guptha, "Principles of Electrical Engineering " ,S.Chand & Co,2002.

5. I.J.Nagrath, "Elements of Electrical Engineering", Tata McGraw Hill Publishing Co., 2002.

6. H.Cotton." Advanced Electrical Technology", Wheeler, 1983.

7. Anokh Singh, Principles of Communication Engineering, S.Chand & Co, 1994.

8. John Kennedy "Electronics Communication System" Tata McGraw Hill.

9. Millman and Halkias, "Electronic Devices and Circuits", Tata McGraw hill.

10. V.K.Mehta,"Principles of Electronics"S.Chand&Co,2002

11. http://en.wikipedia.org/wiki/cell-phone

12. http://en.wikipedia.org/wiki/high-definition-video

13. http://en.wikipedia.org/wiki/tablet-components

14. http://en.wikipedia.org/wiki/cell-phone

15. http://en.wikipedia.org/wiki/android-operating -system

16. http://www.apple.com/pad/

17. http://en.wikipedia.org/wiki/ipad

18. http://en.wikipedia.org/wiki/video-game-console



| YEAR I | | L | T | P | C |
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| SEMESTER | II | 3 | 0 | 0 | 3 |

## NANO SCIENCE & TECHNOLOGY

### UNIT I INTRODUCTION

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties.

### UNIT II PREPARATION METHODS

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

### UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES

Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

### UNIT IV PREPARATION ENVIRONMENTS

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

### UNIT V CHARECTERISATION TECHNIQUES

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS - Nanoindentation

**TEXT BOOKS:**

1. Guanzhong Cao, “Nanostructure and Nano Materials -Synthesis, Properties applications” Imperal College Press, London (2004)

**REFERENCES:**

1. G Timp (Editor), "Nanotechnology", AIP press/Springer, 1999

2. Akhlesh Lakhtakia (Editor), "The Hand Book of Nano Technology, "Nanometer Structure", Theory, Modeling and Simulations. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

3. Rajendran. V, "Engineering Physics", Tata Mc Graw Hill Publication and Co New Delhi, (2009).

4. N John Dinardo, "Nanoscale charecterisation of surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 20001.

5. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.



| YEAR I | L | T | P | C |
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| SEMESTER II | 0 | 0 | 4 | 2 |

## ENGINEERING CHEMISTRY LAB
## (COMMON TO ALL BRANCHES)

1. Estimation of total hardness of water sample by EDTA method.
2. Determination of alkalinity by indicator method.
3. Estimation of ferrous ion by Potentiometry.
4. Titration of strong acid with strong base by Conductometry.
5. Acid base reaction by pH metry.
6. Estimation of copper from its ore.
7. Estimation of iron by spectrophotometer.
8. Estimation of sodium by flame photometer.

| YEAR I | L | T | P | C |
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| SEMESTER II | 0 | 0 | 4 | 2 |

## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (COMMON TO ECE, ETCE, MECHT, BME, BT, BF, EEE, EIE, CSE, IT, CSSE AND CIVIL)

### a) ELECTRICAL ENGINEERING LAB

### LIST OF EXPERIMENTS

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

### B) ELECTRONICS ENGINEERING LAB

1. Familiarization with Electronic Components like R, L, C and active devices.
2. Familiarization with Bread board, CRO, Power supply (RPS, FPS) and Soldering Practice.
3. Generation of lissajous patterns using CRO.
4. Measurement of amplitude and time period using CRO.
5. Study of the Characteristic of PN-Junction diode with its applications.
6. Study of the Characteristic of Zener diode with its applications



7. Study of the rectifier circuits (Half wave and Full Wave) with its applications.
8. Study of BJT Characteristics with its applications.
9. Study of AM/FM Receiver.
10. Study of advanced electronic gadgets.

| YEAR I | | L | T | P | C |
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## ENGINEERING GRAPHICS LAB

## (COMMON TO MECH, AUTOMOBILE, AERONAUTICAL, ECE, EIE, EEE, ETC& MECT)

### UNIT I - PLANE CURVES AND FREE HAND SKETCHING 9

**Curves used in engineering practices:**

Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of squad and circle - Drawing of tangents and normal to the above curves.

### UNIT II - PROJECTION OF POINTS, LINES AND PLANE SURFACES 9

Projection of points and straight lines located in the first quadrant - Determination of true lengths and true inclinations - Projection of polygonal surface and circular lamina inclined to both reference planes.

### UNIT III - PROJECTION OF SOLIDS 9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

### UNIT IV - SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other - Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids - Prisms, pyramids, cylinders and cones - Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.



### UNIT V - ISOMETRIC AND PERSPECTIVE PROJECTIONS 9

Principles of isometric projection - isometric scale - isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method.

**Total: 45 hours**

### TEXT BOOKS :

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).

### REFERENCES BOOKS

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).

2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).

3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).

4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).

5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications (1998).

6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD"Tata McGraw Hill Publishing Company Limited (2008).

7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

**Publication of Bureau of Indian Standards:**

1. IS 10711 - 2001: Technical products Documentation - Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.
3. IS 10714 (Part 20) - 2001 & SP 46 - 2003: Lines for technical drawings.
4. IS 11669 - 1986 & SP 46 - 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Methods.



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| SEMESTER III | 3 | 1 | 0 | 4 |

## ADVANCED ENGINEERING MATHEMATICS

## (COMMON TO CIVIL, MECH, MECHAT,AUTO, AERO, ECE, EEE, CSE, EIE, IT)

**OBJECTIVES:**

♦ Partial differential equations arises in most of the Engineering discipline when the number of independent variables in the given problem under discussion is two or more.

♦ Fourier series is used to express even aperiodic functions in terms of periodic functions making them amenable for further processing.

♦ Fourier series has the wide application in the field of heat diffusion, wave propagation and in signal and systems analysis.

♦ Transform techniques are very useful in the field of signal and system analysis.

♦ Z - transform plays an important role in analysis of Discrete signals. This is a prelude to learn higher semester courses.

**Tutorial : 15** **Total hours: 60**
**Credits : 04**

### 1. PARTIAL DIFFERENTIAL EQUATIONS 9

Formation - Solutions of standard types f(p,q)=0, clairauts form, f(z,p,q)=0,f(p,x)=g(q,y) of first order equations - Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

### 2. FOURIER SERIES 9

Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity - Harmonic Analysis.

### 3. BOUNDARY VALUE PROBLEMS 9

Classification of second order linear partial differential equations

- Solutions of one - dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

**4. FOURIER TRANSFORMS 9**

Statement of Fourier integral theorem - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

**5. Z - TRANSFORM 9**

Z-Transform - Elementary Properties - Inverse Z-Transform - Convolution Theorem - Formation of Difference Equations - Solution of Difference Equations using Z-Transform.

**TEXT BOOK:**

A.Singaravelu,"Transforms and Partial Differential Equations", Meenakshi Agencies,Chennai

**REFERENCES:**

1. T. Veerarajan, "Engineering Mathematics" (for semester III), Third Edition Tata McGraw- Hill Publishing Company limited.

2. Grewal, B.S., "Higher Engineering Mathematics" (35th Edition), Khanna Publishers,Delhi 2000.

3 . Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons,(Asia) Pte Ltd.,Singapore, 2000.



| YEAR II | L | T | P | C |
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| SEMESTER III | 3 | 0 | 0 | 3 |

## ELECTRONIC DEVICES

## (COMMON TO ECE, BME, EEE, EIE)

**AIM**

The purpose of this course is to provide a basis for understanding the characteristics, operation and limitations of various semiconductor devices.

**OBJECTIVES**

1. To understand the basics of electrons and to find the motion of charges in electrostatic and magnetic fields.
2. To understand the basics and characteristics of a Semiconductor and its types in Equilibrium and Non-Equilibrium conditions.
3. To understand the working of PN junction diodes and special purpose diodes.
4. To understand the basic operations of BJT and its characteristics.
5. To understand the Constructional features working and characteristics of FET, UJT and SCR.

**UNIT I: ELECTRON BALLISTICS AND INTRINSIC SEMICONDUCTORS 9**

Force on charge in electric field - Motion of Charge in uniform and time varying electric fields - Force on a moving charge in a magnetic field - calculation of cyclotron frequency - calculation of electrostatic and magnetic deflection sensitivity. Energy band structure of conductors, semiconductors and insulators - Density distribution of available energy states in semiconductors - Fermi- Diac probability distribution function at different temperatures - Thermal generation of carriers - Calculation of electron and hole densities in intrinsic semiconductors - Intrinsic concentration - Mass Action Law.

**UNIT II: EXTRINSIC SEMICONDUCTOR AND PN JUNCTIONS 9**

N and P type semiconductors and their energy band structures - Law of electrical neutrality - Calculation of location of Fermi level and free electron and hole densities in extrinsic semiconductors - Mobility, drift current and conductivity - Diffusion current - Continuity equation - Hall effect. Band structure of PN Junction - Current Component in a PN Junction - Derivation of diode equation - Temperature dependence of diode characteristics.

**UNIT III: SWITCHING CHARACTERISTICS OF PN JUNCTION AND SPECIAL DIODES 9**

Calculation of transition and diffusion capacitance - Varactor diode - charge control description of diode - switching characteristics of diode - Mechanism of avalanche and Zener breakdown - Temperature dependence of breakdown voltages - Backward diode - Tunneling effect in thin barriers Tunnel diode - Photo diode - Light emitting diodes.

**UNIT IV: BIPOLAR JUNCTION TRANSISTORS AND FIELD EFFECT TRANSISTORS 9**

Construction of PNP and NPN transistors - BJT current components - Emitter to collector and base to collector current gains - Base width modulation CB and CE characteristics - Breakdown characteristics - Ebers - Moll model - Transistor switching times. Construction and Characteristics of JFET - Relation between Pinch off Voltage and drain current - Derivation. MOSFETS - Enhancement and depletion types.

**UNIT V: METAL SEMICONDUCTOR CONTACTS AND POWER CONTROL DEVICES 9**

Metal Semiconductor Contacts - Energy band diagram of metal semiconductor junction Schottky diode and ohmic contacts.Power control devices: Characteristics and equivalent circuit of UJT - intrinsic stand off ratio. PNPN diode - Two transistor model, SCR, Triac, Diac.



**TOTAL HOURS: 45**

**TEXT BOOK:**

Jacob Millman & Christos C.Halkias, "Electronic Devices and Circuits" 2nd Edition, Tata McGraw-Hill, 2007.

**REFERENCE:**

1. Nandita Das Gupta and Amitava Das Gupta, Semiconductor Devices - Modelling and Technology, Prentice Hall of India, 2004.
2. Donald A.Neaman," Semiconductor Physics and Devices" 3rd Ed., Tata McGraw-Hill, 2002.
3. S.M.Sze, Semiconductor Devices - Physics and Technology, 2nd edn. John Wiley, 2002.
4. Ben G.Streetman and Sanjay Banerjee, Solid State Electronic Devices, Pearson Education 2000.

| YEAR II | | L | T | P | C |
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| SEMESTER | III | 3 | 1 | 0 | 4 |

## ELECTRIC CIRCUIT ANALYSIS

## (COMMON TO EEE, EIE)

**AIM:**

To study concepts of basic circuits, Network theorems, resonance and coupled circuits, balanced and unbalanced circuits and transient analysis of circuits.

**OBJECTIVE:**

1. To understand basic circuit concepts.
2. To study networks and solution of DC and AC circuits.
3. To understand series and parallel resonance concepts and analysis of coupled circuits.
4. To study protection of balanced and unbalanced loads and measurement of power and power factor in three phase circuits.
5. To understand transient analysis of RL, RC and RLC circuits with DC and sinusoidal excitations.

**UNIT I: BASIC CIRCUIT CONCEPTS 9**

Review of basic concepts- DC & AC circuits - R, L, and C elements phasor diagrams-Complex impedance - Real & Reactive power- Series & Parallel circuits- Formation of matrix equations and analysis of complex circuits using mesh- Current and nodal - Voltage methods.

**UNIT II: NETWORK THEOREMS AND TRANSFORMATIONS. 9**

Voltage - Current - Source transformation. Star Delta transformation - Superposition theorem - Reciprocity theorem - Substitution theorem - Maximum Power Transfer theorems - Thevenin's theorem - Norton's theorem and Millman's theorem with applications.



**UNIT III: RESONANCE AND COUPLED CIRCUITS 9**

Series resonance and parallel resonance - Bandwidth and Q factor. Inductively coupled circuits - Coeffiecient of coupling - Dot convention - Multi winding coupled circuits - Analysis of coupled circuits

**UNIT IV: THREE PHASE CIRCUITS 9**

Analysis of three phase 3 wire and 4 wire circuits with star and delta connected balanced and unbalanced loads- phasor diagram of Voltages and Currents - Measurement of power and power factor in three phase circuits

**UNIT V: TRANSIENT ANALYSIS 9**

Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations. Using Laplace method.

**L=45 T = 15 Total =60 PERIODS**

**TEXT BOOKS**

1. Dr. S. Arumugam, Premkumar, Circuit Theory - Khanna publishers,1991
2. Sudhakar, A. and Shyam Mohan S.P.,'Circuits and Network Analysis and Synthesis', Tata McGraw-Hill Publishing C.Ltd., New Delhi, 2006.

**REFERENCES**

1. Prof.T.Nageswara Rao,"Electric circuit analysis" A.R.Publications.
2. Hyatt, W.H. Jr and Kemmerly, J.E., 'Engineering Circuits Analusis', McGraw-Hill International Editions, 2002.
3. Edminister, J.A., 'Theory and Problems of Electric Circuits', Schaum's outline series McGraw Hill Book Company, 5th Edition, 2011.

| YEAR II | L | T | P | C |
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| SEMESTER III | 3 | 1 | 0 | 4 |

## ELECTRICAL MACHINES - I

**AIM:**

To study the fundamental principles of Electrical machines and the characteristics of D.C Machines and Transformer

**OBJECTIVE:**

i. To understand the basic concepts of magnetic circuits, induced emf and torque.

ii. To familiarize the constructional details, principle of operation, performance, methods of

testing of transformers and three phase transformer connections.

iii. To introduce the principles of electro mechanical energy conversion in single and multiple excited systems.

iv. To study the working of electrical machines using the concepts of electro mechanical energy conversion principles and derive expressions for generated voltage and torque produced.

v. To study the working principles of DC machines as generator and motor, determination of their no load/load characteristics, starting and speed control of DC motors.

**UNIT I: INTRODUCTION 6**

Electrical machines types - Magnetic circuits - Inductance - Statically and dynamically induced EMFs - Torque - Hysteresis - Core losses - AC operation of magnetic circuits.

**UNIT II: TRANSFORMERS 12**

Principle of operation,types,constructional features of single phase transformer- EMF equation- transformer on no load and on load- effects of resistance and leakage reactance of the windings- phasor diagram- equivalent circuit - regulation and efficiency - Three phase transformer - constructional features and connection



zig-zag connection- auto transformer- all day efficiency- Sumpner's test- parallel operation of transformer- off load and on load tap changing transformers.

**UNIT III: ELECTROMECHANICAL ENERGY CONVERSION 9**

Principles of energy conversion - Energy in magnetic systems - Field energy, co-energy and mechanical force -coupling field reaction- energy storage in singly and multiple excited systems- electromechanical transducers.

**UNIT IV: BASIC CONCEPTS IN ROTATING MACHINES 9**

Generated voltages in AC and DC machines - mmf of distributed windings -concepts of rotating machines - rotating mmf waves - Torque in AC and DC machines.

**UNIT V: DC MACHINES 9**

Constructional features of DC machines- EMF equation - armature winding fundamentals- characteristics of different types of dc generators- commutation and armature reaction in DC machines -torque equation- types - characteristics -starters- speed control - Swinburne's test-Hopkinson's test- retardation test- load test- electric braking- parallel operation of DC generators.

**L=45 T = 15 Total =60**

**TEXT BOOKS**

1. Dr.S.K.Bhattacharya, " Electrical Machines" Tata McGraw Hill Publishing, New Delhi,1998

2. Nagrath I.J. And Kothari D.P. "Electric Machines "Tata McGraw Hill Publishing, New Delhi,2002

## REFERENCES


1. Dr.K. MurugeshKumar,"Dc Machines & Transformers" Vikash Publishing House Pvt Ltd,2nd Edition,2000
2. FitzgeraldA.E.,CharlesKingsleyjr,Stephen D.Umans,"Electric Machinery" Tata Mc Graw Hill,6 rev edition,2002
3. Syed a. Nassar," Electric Machines and Power Systems" volume-1 Electric Machines, Tata McGraw Hill,Newyork-1995




| YEAR II | | L | T | P | C |
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| SEMESTER | III | 3 | 0 | 0 | 3 |

## POWER PLANT ENGINEERING

### UNIT I

Introduction: Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles used in power plants. Hydro Electric Power Plants : Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants, site selection, comparison with other types of power plants.

### Unit II

Steam Power Plants : Layout and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator.

Gas Turbine and Combined Cycle Power Plants : Constant pressure gas turbine power plants, Arrangements of combined plants ( steam & gas turbine power plants ), re-powering systems with gas production from coal using PFBC systems, with organic fluids, parameters affecting thermodynamic efficiency of combined cycles.

### Unit III

Nuclear Power Plants: Principles of nuclear energy, basic nuclear reactions, nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal. Non-Conventional Power Generation: Solar radiation estimation, solar energy collectors, low, medium & high temperature power plants, OTEC, wind power plants, tidal power plants, geothermal power plants.

**Unit IV**

Power Plant Economics: Load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-out put curves, efficiency, heat rate, economic load sharing, Problems.

**Unit V**

Direct Energy Conversion Systems: Fuel cell, MHD power generation-principle, open & closed cycles systems, thermoelectric power generation, thermionic power generation.

**Text Books :**


1. Power station Engineering and Economy by Bernhardt G.A. skrotzki and William A. Vopat - Tata Mc Graw Hill Publishing Campany Ltd., New Delhi
2. Power Plant Engineering : P.K. Nag Tata McGraw Hill second Edition 2001.


**Reference Books :**


1. Power Plant Engg. : M.M. El-Wakil McGraw Hill 1985.




| YEAR II | L | T | P | C |
|---|---|---|---|---|
| SEMESTER III | 3 | 0 | 0 | 3 |

## OBJECT ORIENTED PROGRAMMING

**AIM:**

To implement and manipulate object oriented programming concepts

**OBJECTIVES:**

- To implement the concepts of object oriented programming.
- To implement oops structures using object oriented programming language.
- To use standard template library in the implementation oops data structures

**UNIT I** **9**

Object oriented programming concepts - objects - classes - methods and messages - abstraction and encapsulation - inheritance - abstract classes - polymorphism. Introduction to C++ - classes - access specifiers - function and data members - default arguments - function overloading - friend functions - const and volatile functions - static members - Objects - pointers and objects - constant objects - nested classes - local classes

**UNIT II** **9**

Constructors - default constructor - Parameterized constructors - Constructor with dynamic allocation - copy constructor - destructors - operator overloading - overloading through friend functions - overloading the assignment operator - type conversion - explicit constructor

**UNIT III** **9**

Function and class templates - Exception handling - try-catch-throw paradigm - Exception specification - terminate and Unexpected functions - Uncaught exception.

**UNIT IV** **9**

Inheritance - public, private, and protected derivations - multiple inheritance - virtual base class - abstract class - composite objects Runtime polymorphism - virtual functions - pure virtual functions - RTTI - type id - dynamic casting - RTTI and templates - cross casting - down casting .

**UNIT V** **9**

Streams and formatted I/O - I/O manipulators - file handling - random access - object serialization - namespaces - std namespace - ANSI String Objects - standard template library.

**Total: 45 PERIODS**

**TEXT BOOKS:**

1. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.

**REFERENCES:**

1. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition Reprint 2004..

2. S. B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Primer", Fourth Edition, Pearson Education, 2005.

3. B. Stroustrup, "The C++ Programming language", Third edition, Pearson Education, 2004.



| YEAR II | L | T | P | C |
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| SEMESTER III | 0 | 0 | 4 | 2 |

## ELETRIC CIRCUITS AND ELECTRONIC DEVICES LAB (COMMON TO EEE & EIE)

**AIM**

To verify practically, the fundamental characteristics of Electron Devices and various theorems.

**OBJECTIVES**

- To verify the various theorems
- To study experimentally the characteristics of diodes, BJT's and FET's.
- To verify practically, the response of various special purpose electron devices.

**LIST OF EXPERIMENTS**

- Verification of Thevenin's and Norton's Theorem.
- Verification of super position and compensation Theorem.
- Verification of Reciprocity and Maximum Power Transfer Theorem.
- Series and Parallel Resonance Circuits.
- Transients in RLC Circuits.
- Series and Parallel AC Circuits and Phasor Diagram.
- Coupled Circuits and Tuned Circuits.
- Characteristics of Transistor under common Emitter configuration.
- Characteristics of Transistor under Common Base Configuration.
- Characteristics of Transistor under Common collector configuration.
- Characteristics of UJT and FET.

" Characteristics of SCR, DIAC and TRIAC.

| YEAR II | L | T | P | C |
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| SEMESTER III | 0 | 0 | 3 | 2 |

## ELECTRICAL MACHINES LABORATORY - I

**1. Load test on dc shunt motor**

Aim: To conduct load test on dc shunt motor and plot its performance characteristics.

**2. Load test on dc series motor**

Aim: To conduct load test on dc series motor and plot its performance characteristics.

**3. Speed control of dc shunt motor**

Aim: To control the speed of a dc shunt motor by (i) armature control and (ii) field control methods.

**4. OCC & load test on dc self and separately excited generator**

Aim: To conduct OCC and load test on dc self and separately excited generators.

**5. OCC& load test on dc shunt generator**

Aim: To conduct OCC and load test on dc shunt generator.

**6. Load test on dc compound generator**

Aim: To conduct load test on dc compound generator.

**7. Load test on single phase transformer**

Aim: To conduct load test on single phase transformer and determine its efficiency and regulation.

**8. OC&SC test on single phase transformer**

Aim: To conduct open circuit and short circuit tests on single phase transformer and hence determine the parameters of the equivalent circuit.

**9. Swinburne's test**

Aim: To conduct Swinburne's test on a dc shunt motor and predetermine its efficiency as a (i) generator and (ii) motor.



**10. Separation of Losses in single phase transformer.**

Aim: To determine the no load losses in a single phase transformer.

**11. Hopkinson's test**

Aim: To conduct Hopkinson's test and predetermine its efficiency of a dc machine as a (i) generator and (ii) motor.

**12. Sumpner's test on 1-phase transformer**

Aim: To conduct Sumpner's test on a single phase transformer and predetermine its efficiency.

**13. Study of three phase transformer connections.**

Aim: To study the various three phase transformer connections.

**14. Study of DC Starters.**

Aim: To study the different types of DC motor starters.

**Total Hours: 45**

| YEAR II | L | T | P | C |
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| SEMESTER III | 0 | 0 | 3 | 2 |

## OBJECT ORIENTED PROGRAMMING LAB

### LIST OF EXPERIMENTS

1. Design C++ classes with static members, methods with default arguments, friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication)

2. Implement complex number class with necessary operator over loadings and type conversions such as integer to complex, double to complex, complex to double etc.

3. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor, and overloading of assignment operator.

4. Overload the new and delete operators to provide custom dynamic allocation of memory.

5. Develop a template of linked-list class and its methods.

6. Develop templates of standard sorting algorithms such as bubble sort, insertion sort, merge sort, and quick sort.

7. Design stack and queue classes with necessary exception handling.

8. Define Point class and an Arc class. Define a Graph class which represents graph as a collection of Point objects and Arc objects. Write a method to find a minimum cost spanning tree in a graph.

9. Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism and RTTI.

10. Write a C++ program that randomly generates complex numbers (use previously designed Complex class) and writes them two per line in a file along with an operator (+, -, *, or /). The numbers are written to file in the format (a + ib). Write another program to read one line at a time from this file, perform the corresponding operation on the two complex numbers read, and write the result to another file (one per line).



| YEAR II | L | T | P | C |
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| SEMESTER IV | 3 | 0 | 2 | 4 |

## NUMERICAL METHODS

### (COMMON TO MECH, AERO, AUTO, MECT, CIVIL, EEE & EIE )

**Objectives:**

- Computing the trajectory of a spacecraft requires the accurate numerical solution of a system of ordinary differential equations.
- It is used in Kinematics Simulation, Complex System Optimization
- Car companies can improve the crash safety of their vehicles by using computer simulations of car crashes. Such simulations essentially consist of solving partial differential equations numerically.
- Numerical linear algebra is important for data analysis.
- Airlines use sophisticated optimization algorithms to decide ticket prices, airplane and crew assignments and fuel needs. Historically, such algorithms were developed within the overlapping field of operations research.

### 1. SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

Method of false position, Newton-Raphson method for single variable, Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss- Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power Method.

### 2. INTERPOLATION AND APPROXIMATION 9

Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference Formula (Stirling's and Bessel's ).

**3. NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both 1/3 and 3/8 th ) rules. Rombergs rule, Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

**4. INITIAL VALUE PROBLEMS OF ODE 9**

Solution of equations related to simple harmonic motion, Oscillations of a spring mass system, Simple pendulum, Oscillatory electrical circuit and Deflection of beams with initial conditions - using Taylor series. Euler, Modified Euler and Runge-Kutta methods.

**5. BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9**

Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

**Practical: 30**

**Total hours: 75**

**Credits: 04**

**TEXT BOOK**


1. A. Singaravelu ,"Numerical Methods" , Meenakshi Agency, Chennai
2. B.S.Grewal,"Higher Engineering Mathematics"Khanna Publishers,New Delhi.


**REFERENCES**


1. Sastry, S.S., " Introductory Methods of Numerical Analysis (Third Edition) ", Printice Hall of India, New Delhi, 1998.
2. T.Veerarajan, T.Ramachandran, " Numerical Methods with Programs in C and C++", Tata McGraw-Hill (2004).
3. Grewal, B.S. and Grewal, J.S., Numerical Methods in Engineering and Science Khanna Publishers, New Delhi, 1999.
4. N.Subramanian,Numerical Methods,SCM Publishers,Erode.


**Note :** Practical is only for students practice, not for the examination.

| YEAR II | L | T | P | C |
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| SEMESTER IV | 3 | 1 | 0 | 4 |

## TRANSMISSION AND DISTRIBUTION

**AIM:**

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

**OBJECTIVES:**

1. To understand structure of electric power systems, its various operating voltages.

2. To study transmission line parameters for different systems and corona effect.

3. To understand modeling and performance of different transmission lines.

4. To study different types of insulators and constructional features of HT & LT cables.

5. To understand classification and functions of major components of substations.

**UNIT I: INTRODUCTION 9**

Structure of electric power system - different operating voltages of generation, transmission and distribution -advantage of higher operating voltage for AC transmission. An introduction to HVDC and EHV AC transmission. FACTS Devices Mechanical design of transmission line between towers - sag and tension calculations using approximate equations taking into account the effect of ice and wind.

**UNIT II: TRANSMISSION LINE PARAMETERS 9**

Parameters resistance, inductance and capacitance calculations - single and three phase transmission lines - single and double circuits - solid, stranded and bundled conductors - symmetrical and unsymmetrical spacing - transposition of lines - concepts of GMR



and GMD - Skin and Proximity effects - interference with neighbouring communication circuits - Corona discharge - characteristics - critical voltage and loss. (Simple diagrams of typical towers and conductors for 400, 220 ,110,66 and 33 kV operations)

**UNIT III: MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9**

Transmission line classification - short line, medium line and long line - equivalent circuits - Ferranti effect - surge impedance, attenuation constant and phase constant - voltage regulation and transmission efficiency - real and reactive power flow in lines - power circle diagrams - shunt and series compensation. An introduction to power angle diagram - surge - impedance loading, loadability limits based on thermal loading; angle and voltage stability considerations.

**UNIT IV: INSULATORS AND CABLES 9**

Classification of insulators for transmission and distribution purpose - voltage distribution in insulator string and grading - improvement of string efficiency. Underground cables - constructional features of LT and HT cables - insulation resistance, capacitance, dielectric stress and grading - tan ? and power loss - thermal characteristics.

**UNIT V: SUBSTATION , GROUNDING SYSTEM AND DISTRIBUTION SYSTEM 9**

Classification functions and major components of substations. Bus-bar arrangements - substation bus schemes - single bus, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breaker- and - a half with two main buses, double bus-bar bypass isolators. Importance of earthing in a substation. Qualitative treatment to neutral grounding and earthing practises in substations. Feeders, distributors and service mains. DC distributor - 2 - wire and 3 - wire, radial and ring main distribution. AC distribution - single phase and three phase 4 -wire distribution.

**L=45 T = 15 Total =60**

**TEXT BOOKS**

1. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003.

2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

**REFERENCE BOOKS**

1. Luces M.Fualkenberry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.

2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.

3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.

4. 'Tamil Nadu Electricity Board Handbook', 2003.



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| YEAR II | L | T | P | C |
| SEMESTER IV | 3 | 0 | 0 | 3 |

## ELECTRICAL MACHINES-II

**AIM:**

To study the theory, operation and performance of AC machines.

**OBJECTIVES:**

- To impart knowledge on construction and performance of salient and non - salient type synchronous generators.
- To understand the principle of operation and performance of synchronous motor.
- To gain knowledge about construction, principle of operation and performance of induction machines.
- To gain knowledge about the various starting and speed control methods of three-phase induction motors.
- To understand the Construction, principle of operation and performance of single phase induction motors and special machines.

### I. SYNCHRONUS GENERATOR 9

Construction - types of rotor - EMF equation - synchronous reactance - synchronous impedance-armature reaction - voltage regulation - EMF,MMF,ZPF and ASA methods -synchronizing - parallel operation -salient pole synchronous machines- two reaction theory - determination of Xd andXqusing slip test - operating characteristics - capability curves.

### II. SYNCHRONOUS MOTOR 9

Principle of operation - starting methods - torque equation - synchronous motor on no load and load - operation of synchronous motor at constant load - variable excitation - V curve and inverted V curve - hunting.

### III. THREE PHASE INDUCTION MOTOR 9

Construction and types of rotor - principle of operation - slip-torque

equation -equivalent circuit - slip torque characteristics - condition for maximum torque - losses and efficiency - load test - no load and blocked rotor tests - circle diagram - cogging and crawling - separation of no load losses - double cage rotors - induction generator - synchronous induction motor.

**IV. STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9**

Need for starting - types of starters - stator resistance and reactance starters, rotor resistance starter, auto transformer and star-delta starters - speed control - change of voltage - change of number of poles - change of frequency - cascade connection - slip power recovery scheme.

**V. SINGLE PHASE INDUCTION MOTOR AND SPECIAL MACHINES 9**

Construction of single phase induction motor - double revolving field theory - equivalent circuit - load characteristics - starting methods of single phase induction motor - variable reluctance motor - stepper motor - hysteresis motor - AC series motor -repulsion motor - linear induction motor - permanent magnet DC and AC motors.

**Total Hours = 45**

**TEXT-BOOK**

1. Nagrath I.J and Kothari D.P, "Electrical machines", T.M.H publishing co-Ltd, New delhi,1997

2. B.L .Theraja and A.K Theraja, "A text book of Electrical Technology-volume-II", McGraw Hill, Newyork, 1995.

**REFERENCE BOOK**

1. Syed A.Narser, "Electrical Machines and Power System-volume-II", McGraw Hill, Newyork, 1995

2. J.B Gupta, "Theory and performance of Electrical Machines", S.K Kataria and sons, Delhi.

3. Fitzgerald , A.E. Charles Kingsley Jr.. Stephen D. Umans , " Electric Machinery ".McGraw Hill Book Company , 1992.



| YEAR II | | L | T | P | C |
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| SEMESTER | IV | 3 | 1 | 0 | 4 |

## ELECTRO MAGNETIC THEORY

## (COMMON TO EEE & EIE )

**AIM:**

To introduce the fundamentals of electromagnetic fields and their applications in Engineering.

**OBJECTIVE:**

i. To impart knowledge on concepts of electrostatics, electrical potential, energy density and their applications.

ii. To familiarize the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.

iii. To understand Faraday's laws, Maxwell's equations, induced emf and their applications.

iv. To understand the concepts of electromagnetic waves and Pointing vector.

v. To understand the concepts of field modelling and computation.

**1. ELECTROSTATICS 9**

Introduction- Charge - Coulomb's law - Continuous charge distribution - Electric field intensity - Electric flux - Gauss's law - Potential - boundary value problems - Laplace and Poisson's equations -Electrostatic energy - dielectrics - Capacitance.

**2. MAGNETOSTATICS 9**

Current Density - Magnetic field - Magnetic flux - Magnetic flux density - Biot-Savart's law -Ampere's law - torque - force - vector potential - boundary value problem.

**3. ELECROMAGNETIC FIELDS 9**

Faraday's law - Lenz's law - Self inductance - mutual inductance - co-efficient of coupling - Dot rule for coupled circuits -

series, parallel - inductance of solenoid, Toroid, Maxwell's equations (boundary conditions) - displacement current - eddy current - Difference between field theory and circuit theory .

**4. ELECTROMAGNETIC WAVES 9**

Introduction - Solution of wave equation in free space - Conducting mediam -Uniform plane wave propagation, phase velocity, Group velocity - Conductors and transmission lines - Pointing vector - Skin effect.

**5. FIELD MODELLING AND COMPUTATION 9**

Problem formulation - boundary conditions - solutions - analytical methods - variables separable methods - conformal transformation - method of images - numerical methods - finite difference method - finite element method - charge simulation method

**L=45 T = 15 Total =60**

**TEXT BOOKS**

1. John D Kraus, 'Electromagnetics', McGraw-Hill Book Co., New York, Third Edition, 1989.

2. Joseph A Edminister, 'Theory and Problems of Electro magnetics', Schaums outline series McGraw-Hill book company New York, 1995.

3. William H.Hayt, Jr., 'Engineering Electromagnetic,' Tata McGraw-Hill Edition, New Delhi, 1998.

**REFERENCES**

1. David J Griffith, 'Introduction to Electrodynamics,' Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 1997.

2. Richard E. Dubroff, S.V.Marshall, G.G.Skitek, 'Electromagnetic Concepts and Applications', Fourth Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 1996.

3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw-Hill International Editions Fifth Edition 1999.



| YEAR II | L | T | P | C |
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| SEMESTER IV | 3 | 0 | 0 | 3 |

## ELECTRONIC CIRCUITS

## (COMMON TO BME, EEE & EIE )

**AIM:**

The aim of this course is to introduce to the students the rectifiers, power supplies, basics of biasing transistor circuits, low frequency amplifiers, multi stage amplifiers, power amplifiers, tuned amplifiers, feedback amplifiers and oscillators.

**OBJECTIVES:**

To understand the basic operation of rectifiers, filters and power Supplies To study the biasing circuits and analyze the small signal BJT amplifiers To understand the working and to find the efficiency of different types of large signal amplifiers To understand the basic concept and working of various types of feedback amplifiers and oscillators. To understand the working of different types of tuned amplifiers and multivibrators and their analysis.

**UNIT I RECTIFIERS AND POWER SUPPLIES 9**

Half Wave and Full Wave Rectifier-Bridge rectifier-performance measures of rectifiers-filters-Full Wave rectifier with inductive filter, capacitive filter, LC filter, π section filter, multiple LC Filter-Regulators-Shunt and series voltage regulators-Performance measures of regulators.

**UNIT II BIASING CIRCUITS AND ANALYSIS OF SMALL SIGNAL BJT AMPLIFIERS 9**

Biasing circuit of BJT, DC equivalent circuit of BJT, DC and AC Load Lines, Stability factor analysis, Types of amplifiers-Small Signal Equivalent circuit-Calculation of gain, Input and Output Impedance of various amplifiers using h-Parameters.

**UNIT III MULTISTAGE AMPLIFIERS AND POWER AMPLIFIERS 9**

Introduction-Two stage RC Coupled amplifier-Cascade amplifier-Darlington emitter follower amplifier-Bootstrap amplifier Introduction-Class A Power Amplifier-Push Pull Principle-Class B push pull amplifier and complementary symmetry amplifier-Class C amplifier-Distortion in amplifiers-Collector power dissipation-efficiency and figure of merit calculation-Maximum power dissipation hyperbola.

**UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS 9**

Introduction-Performance analysis of feedback amplifiers-Voltage and current feedback amplifiers-Barkhausen Criterion for Oscillation-RC and Wein bridge oscillator, Hartley Oscillator, Colpitts Oscillator-Crystal Oscillator-Stabilization in Oscillator.

**UNIT V TUNED AMPLIFIERS AND MULTIVIBRATORS 9**

Single tuned amplifier-Stagger tuned amplifier-Tuned amplifier instability-Neutralization and Unilateralization.

**TOTAL HOURS: 45**

**TEXT BOOKS:**

1. Robert L. Boystead and Louis Nashelky, "Electronic Devices and Circuits", 8th Edition, PHI, 2005.

**REFERNCE BOOKS**

1. Theodore F. Bogart Jr., Jeffrey S. Beasley, Guillermo Rico, "Electronic devices and circuits", PPH, 2004.

2. Millman & Halkias, "Integrated Electronics", McGraw Hill International Edition. 1991

3. David A. Bell, "Electronic Devices and Circuits", PHI, 2004.



| YEAR II | L | T | P | C |
|---|---|---|---|---|
| SEMESTER IV | 3 | 0 | 0 | 3 |

## DIGITAL ELECTRONICS

**AIM**

The Aim of this course is to develop a strong foundation in analysis and design of digital electronics.

**OBJECTIVES:**

- Understand the basic concepts.
- Understand concepts of logic gates constructional features.
- To understand the concepts of gate-level minimization & combinational logic.
- To analyze synchronous sequential logic.
- To realize the hazard free circuits and pulse mode sequential Circuits.

**1. BASIC COCEPTS AND BOOLEAN ALGEBRA 9**

Number systems - Binary, Octal, Decimal, Hexadecimal, conversion from one to another, complement arithmetic, Boolean theorems of Boolean algebra, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map, Tabulation and computer aided minimization procedures.

**2. LOGIC GATES 9**

RTL, DTL, TTL, ECL, ICL, HTL, NMOS & CMOS logic gates, Circuit diagram and analysis characteristics and specifications, tri-state gates.

**3. COMBINATIONAL CIRCUITS 9**

Problem formulation and design of combinational circuits, Adder / Subtractor, Encoder / decoder, Mux / Demux, Code-converters, Comparators, Implementation of combinational logic using

standard ICs, ROM, EPROM, EEPROM, Basics of PLD, PAL, PLA and their use in combinational circuit design.

**4. SEQUENTIAL CIRCUITS 9**

Flip flops - SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis of clocked sequential circuits - their design, State minimization, state assignment, Circuit implementation, Registers-Shift registers, Ripple counters, Synchronous counters, Timing signal, RAM, Memory decoding, Semiconductor memories.

**5. FUNDAMENTAL MODE SEQUENTIAL CIRCUITS 9**

Stable, Unstable states, Output specifications, Cycles and Races, Race free Assignments, Hazards, Essential hazards, Pulse mode sequential circuits.

**TOTAL HOURS: 45**

**TEXT BOOK:**

1. Morris Mano, "Digital logic and Computer Design ", Prentice-Hall of India, 3rd edition, 2008.

**REFERENCE BOOKS:**

1.William I. Fletcher, "An Engineering Approach to Digital Design ", Prentice-Hall of India, 1980.

2.Floyd T.L., "Digital Fundamentals ", Charles E. Merrill publishing Company, 1982.

3.Tokheim R.L., "Digital Electronics - Principles and Applications ", Tata McGraw Hill, 1999.

4.Jain R.P., "Modern Digital Electronics ", Tata McGraw Hill, 1999.



| YEAR II | L | T | P | C |
|---|---|---|---|---|
| SEMESTER IV | 0 | 0 | 3 | 2 |

## ELECTRICAL MACHINES LAB- II

**1. Regulation of 3-phase alternator by EMF and MMF methods.**

Aim: To predetermine the regulation of 3-phase alternator by EMF and MMF methods.

**2. Regulation of 3-phase alternator by ZPF and ASA method.**

Aim: To predetermine the regulation of 3-phase alternator by ZPF and ASA methods.

**3. Slip test on 3-phase alternator.**

Aim: To predetermine the regulation of 3-phase alternator by conducing slip test.

**4. Load characteristics of 3-phase alternator by bus bar loading**

Aim: To synchronize 3-phase alternator with bus bar and determine its load characteristics.

**5. V and inverted V curve of synchronous motors.**

Aim: To draw the V and inverted V curves of synchronous motor.

**6. Load test on 3-phase induction motor (s).**

Aim: To conduct load test on 3-phase squirrel cage induction motor and determine its performance characteristics.

**7. No load and blocked rotor test on 3-phase induction motor.**

Aim: To conduct no load and blocked rotor tests on 3 phase squirrel cage induction motor and obtain the parameters of the equivalent circuit.

**8. Study of Synchronous induction motor.**

Aim: To study the operation of Synchronous induction motor.

**9. Study of induction motor starters.**

Aim: To study the various induction motor starters

**10. Separation of losses in three-phase induction motor.**

Aim: To determine the no load losses in three-phase induction motor.

**11. Load test on 1-phase induction motor.**

Aim: To conduct load test on single phase induction motor and determine its performance characteristics.

**12. Equivalent circuit and pre - determination of performance characteristics of single-phase induction motor.**

Aim: To conduct no load and blocked rotor tests on single phase induction motor and determine the parameters of equivalent circuit.

**Total Hours: 45**



| YEAR II | L | T | P | C |
|---|---|---|---|---|
| SEMESTER IV | 0 | 0 | 4 | 2 |

## ELECTRONIC CIRCUITS & DIGITAL ELECTRONICS LAB (COMMON TO EEE & EIE)

### ELECTRONICS CIRCUITS

**AIM:**

To provide the knowledge of design and implementation of Electronic circuits using Amplifiers

**OBJECTIVES:**

Designing the basic electronic circuits like Class A,B,C Amplifier & Oscillators

1. Design and construct BJT Common Emitter Amplifier using voltage divider bias (self-bias) with and without bypassed emitter resistor.
2. Differential amplifier using BJT
3. Class A Power Amplifier
4. Series and Shunt feedback amplifiers:
5. Design of RC Phase shift and Hartley oscillator.
6. Design of Single Tuned class-c Amplifier

### DIGITAL ELECTRONICS

**AIM:**

To provide the knowledge of design and implementation of digital circuits using logic gates and flip flops.

**OBJECTIVES:**

Designing the basic digital circuits like adders, sub tractors, code converters using logic gates and counters using flip flops.

1. Design and implementation of Adders & Sub tractors using logic gates

2. Design and implementation of BCD to Excess -3 code converter using logic gates

3. Design and implementation of Binary to Gray code converter using logic gates

4. Design and implementation of 4 bit BCD adder using IC 7483

5. Design and implementation of Multiplexer and De-Multiplexer using logic gates

6. Design and implementation of 3 bit synchronous up/down counter



| YEAR II | L | T | P | C |
|---|---|---|---|---|
| SEMESTER IV | 0 | 0 | 2 | 1 |

## PROFESSIONAL COMMUNICATION AND PERSONALITY DEVELOPMENT (COMMON TO ALL BRANCHES)

**AIM:** To develop graduates with good Presentation and Writing skills (Professional & Technical)

**OBJECTIVES:** To improve Aptitude Skills, train to improve self-learning/researching abilities, Presentation Skills & Technical Writing (Reports, Brochures, Manuscripts/Articles)

**METHODOLOGY:** Modular Evaluation will be done based on Continuous Internal Assessment as Assignments, Short Communications, Proposals, Briefs, Reports, etc. Final Evaluation will be based on a Real-time research article based on current research carried out in the Institution or by any Faculty of the Institution (Good articles can be submitted to Journals co-authored by the Student and Faculty, with affiliation to the Institution)

**UNIT I - COMMUNICATION AND SELF DEVELOPMENT:** Basic Concepts of Communication; Process of Communication; Types of Formal communication; The Media of Communication; Channels of Communication; Barriers in Communication; How to Overcome Barriers to Communication.

**UNIT II - GRAMMAR & SYNTAX:** Synonyms; Antonyms; Words used as different parts of speech; Spotting errors; Concord; Principle of proximity between subject and verb. Sentence Structure; Combination and Transformation of sentences; Verb Patterns in English.

**UNIT III - READING AND WRITING SKILLS:** Purpose and Process of Reading; Reading Tactics; Reading Strategies; Reading Comprehension; Paraphrase; Preparing outlines of paragraph/text. Elements of Effective Writing; Job Application, Bio-data, Personal Resume and Curriculum Vitae; Preparing Agenda and Minutes of

a Meeting; Back office job for organizing a conference/seminar; Writing Styles; Scientific and Technical Writing; Summary Writing; Writing paragraphs; Writing Essays.

**UNIT IV - LISTENING AND SPEAKING SKILLS:** Process of listening; Hard and Soft Skills; Feedback Skills; Essentials of Good Communications; Types of Listening; Barriers to Listening; Note taking and Note making. Skills of Effective Speaking; Component of an Effective Talk; Tone of Voice; Accent, Body Language; Timing and Duration of Speech; Audio-Visual Aids in Speech.

**UNIT V - TECHNICAL REPORT, RESEARCH CASE STUDY & REPORTING:** Main considerations in writing a good report; Types and Structure of Reports; Collecting Data; Technical Proposals; Visual Aids; General Tips for Writing Reports. Research Case Study and Reporting

**Text Book**

1. The Functional Aspects of Communication Skills, Prajapati Prasad and Rajendra K. Sharma, S. K Kataria & Sons, New Delhi, Rep"nt 2007.

**Reference Books**

1 Business Communication, Sinha K. K, S. Chand, New Delhi.

2. Business Communication, Asha Kaul, Prentice Hall of India.

3 Business Correspondence and Report Writing' A Practical Approach to Business and

Technical Communication, Sharma, R.C. and Krishna Mohan, Tata McGraw-HilI.

4 A New Approach to English Grammar for High Schools, Madan Sabina, Spectrum Books, New Delhi



| YEAR III | | L | T | P | C |
|---|---|---|---|---|---|
| SEMESTER | V | 3 | 0 | 0 | 3 |

## POWER ELECTRONICS

## (COMMON TO EEE & EIE)

**AIM**

To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.

**OBJECTIVES**

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and Matrix converters.

**UNIT I POWER SEMI-CONDUCTOR DEVICES 9**

Overview of switching devices - Driver and snubber circuit of SCR, TRIAC, GTO, IGBT, MOSFET - Computer simulation of PE circuits.

**UNIT II PHASE CONTROLLED CONVERTERS 9**

2 pulse / 3 pulse and 6 pulse converters - Effect of source inductance - performance parameters - Reactive power control of converters - Dual converters.

**UNIT III DC TO DC CONVERTERS 9**

Stepdown and stepup chopper - Forced commutation techniques - Time ratio control and current limit control - Switching mode regulators Buck, Boost, Buck-Boost - concept of resonant switching.

**UNIT IV INVERTERS** **9**

Single phase and three phase [120o & 180o mode] inverters - PWM techniques - Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM - Voltage and harmonic control - Series resonant inverter - current source inverter.

**UNIT V AC TO AC CONVERTERS** **9**

Single phase AC voltage controllers - Multistage sequence control - single phase and three phase cycloconverter - power factor control - Matrix converters.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.

2. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", John wiley and Sons, 3rd Edition, 2006.

**REFERENCES:**

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.

2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.

3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.



| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER V | 3 | 1 | 0 | 4 |

## CONTROL SYSTEMS

**AIM**

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

**OBJECTIVE**

i. To understand the methods of representation of systems and to desire their transfer function models.

ii. To provide adequate knowledge in the time response of systems and steady state error analysis

iii. To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.

iv. To understand the concept of stability of control system and methods of stability analysis.

v. To study the three ways of designing compensation for a control system

**UNIT I SYSTEMS AND THEIR REPRESENTATION 12**

Basic elements in control systems - Open and closed loop systems - Electrical analogy of mechanical and thermal systems - Transfer function - Synchros - AC and DC servomotors - Block diagram reduction techniques - Signal flow graphs.

**UNIT II TIME RESPONSE** **9**

Time response - Time domain specifications - Types of test input - I and II order system response - Error coefficients - Generalized error series - Steady state error - P, PI, PID modes of feed backcontrol.

**UNIT III FREQUENCY RESPONSE 9**

Frequency response - Bode plot - Polar plot - Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications.

**UNIT IV STABILITY OF CONTROL SYSTEM 9**

Characteristics equation - Location of roots in S plane for stability - Routh Hurwitz criterion - Root locus construction - Effect of pole, zero addition - Gain margin and phase margin -Nyquist stability criterion.

**UNIT V COMPENSATOR DESIGN 6**

Performance criteria - Lag, lead and lag-lead networks - Compensator design using bode plots.

**L = 45 T = 15 TOTAL = 60 PERIODS**

**TEXT BOOKS**

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

**REFERENCES**

1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.

2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.

3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004

4. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.



| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER V | 3 | 0 | 0 | 3 |

## EMBEDDED SYSTEMS

**AIM**

To learn the basic concepts of embedded systems and its applications.

**OBJECTIVES**

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts and embedded programming in C and C++
- To introduce the software development tools in embedded systems.
- To introduce the concepts of Real Time Operating System.

**UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9**

Definition -Processor Embedded into a System - Embedded Hardware Units and Devices in system -Embedded Software in a System - Examples of Embedded system -System on Chip (Soc) and Use of VLSI Design Technology - Complex Design and Processors - Design Process - Formalizations of System Design - Design Process and Design Examples - Classifications of Embedded Systems.

**UNIT II DEVICES AND BUSES FOR DEVICES NETWORK 9**

Device I/O Types and Examples - Serial Communication Devices - Parallel Devices Ports - Sophisticated Interfacing Features in Devices Ports - Wireless Devices - Timer and Counting Devices - Watchdog Timer - Real Time Clock - Networked Embedded Systems - Serial Bus Communication Protocols - Parallel Bus Device

Protocol - Parallel Communication Network Using ISA, PCI, PCI-X, cPCI and advanced buses.

**UNIT III PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++ 9**

Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls - Multiple function calls in a Cyclic Order in the Main Function Pointers - Function Queues and Interrupt Service Routines Queues Pointers - Concepts of EMBEDDED PROGRAMMING in C++ - Objected Oriented Programming - Embedded Programming in C++, 'C' Program compilers - Cross compiler- Optimization of memory codes.

**UNIT IVSOFTWARE DEVELOPMENT AND TOOLS 9**

Embedded system evolution trends. Round - Robin, robin with Interrupts, function-One-Scheduling Architecture, Algorithms. Introduction to-assembler-compiler-cross compilers and Integrated Development Environment (IDE). Object Oriented Interfacing, Recursion, Debugging strategies, Simulators.

**UNIT VREAL TIME OPERATING SYSTEMS 9**

Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Message queues-Timer Function-Events-Memory Management, Interrupt Routines in an RTOS environment, basic design Using RTOS.

**TOTAL HOURS: 45**

**TEXT BOOKS:**

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, Second Edition, Sixth reprint Oct. 2010

2. David E Simon, "An embedded software primer ", Pearson education Asia, Eighth Impression, 2009.



**REFERENCE BOOKS:**

1. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,

2. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design - Harcourt India, Morgan Kaufman Publishers, 2008.

3. Frank Vahid and Tony Givargis, "Embedded Systems Design - A unified Hardware /Software Introduction", John Wiley, 2006.

| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER V | 3 | 1 | 0 | 4 |

## LINEAR INTEGRATED CIRCUITS

### AIM

To provide the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

### OBJECTIVES

- To introduce the basics of Integrated Circuits and its fabrication.
- To familiarize with operational amplifiers and its Characteristics.
- To introduce the applications of Operational Amplifier
- To Introduce about the regulator and filters.
- To introduce ADC/ DAC and PLL.

### UNIT - I: Integrated Circuit Fabrication 9

Classifications of ICs - IC chip size and Circuit Complexity - Fundamentals of Monolithic IC Technology - Basic Planar Process - Fabrication of Typical Circuit - Active and Pasive Components of ICs - Fabrication of FET - Thick and Thin Film Technology - Technology Trends.

### UNIT - II: Operational Amplifier and its Characteristics 9

Basic Information of operational Amplifier - Ideal Operational Amplifier - Operational Amplifier Internal Circuits - Examples of IC Op Amps - FET Operational Amplifiers - DC Characteristics - AC Characteristics - Analysis of Data Sheets of an Op Amp.

### UNIT - III: Operational Amplifier Applications 9

Basic Op Amp Applications - Instrumentation Amplifiers - AC Amplifiers - V to I and I to V Converters - Op Amp Circuits Using Diodes - Sample and Hold Circuits - Log/Antilog Amplifiers - Adder/ Subtractor - Multiplier and Divider - Differentiator and Integrator -



Operational Trans conductance Amplifier - Comparators - Multivibrators - Square, Triangular and Sawtooth wave Generators.

### UNIT - IV: Regulators and Filters 9

Series Op Amp Regulators - IC Voltage Regulators - 723 General Purpose Regulators - Switching regulators - RC Active Filters - Transformation - State variable Filter - Switched Capacitor Filters - Active Filters using OTA's.

### UNIT - V: D/A and A/D Converters, Timers and PLL 9

Timer - Description of Functional Diagram - Monostable and Astable Operation - Schmitt Trigger - PLL - Basic Principles - Phase Detectors/ Comparators - Voltage Controlled Oscillator - Low Pass Filter - Monolithic PLL - PLL Applications - Basic DAC Techniques - A-D Converters - DAC/ ADC Specifications.

**TUTORIAL: 15**

**TOTAL HOURS: 60**

### Text Book:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuits", New Age International Publishers, 3rd Edition 2007.

### Reference Books:

1. Segio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill, 2008.

2. Ramakant A. Gayakwad, "OP - AMP and Linear ICs", Prentice Hall, 1994.

3. Botkar K. R., "Integrated Circuits", Khanna Publishers, 1996.

4. Gray and Mayer, "Analysis and design of Analog Integrated Circuits", Wiley International, 1995.

| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER V | 3 | 0 | 0 | 3 |

## DATA STRUCTURES

**AIM:**

The aim is to introduce the concept of storage of data using list, stack, queue

**OBJECTIVES:**

- To introduce the concepts of Advanced Data Structures.
- To introduce the concepts of Tree

**Unit I Linear Structures 9**

Abstract Data Types (ADT) - List ADT - array-based implementation - linked list implementation - cursor-based linked lists - doubly-linked lists - applications of lists -Stack ADT - Queue ADT - circular queue implementation - Applications of stacks and queues

**Unit II Tree Structures 9**

Tree ADT - tree traversals - left child right sibling data structures for general trees - Binary Tree ADT - expression trees - applications of trees - binary search tree ADT - Threaded Binary Trees.

**Unit III Balanced Trees 9**

AVL Trees - Splay Trees - B-Tree - heaps - binary heaps - applications of binary Heaps

**Unit IV Hashing and Set 9**

Hashing - Separate chaining - open addressing - rehashing - extendible hashing - Disjoint Set ADT - dynamic equivalence problem - smart union algorithms - path compression - applications of Set



**Unit V Graphs 9**

Definitions - Topological sort - breadth-first traversal - shortest-path algorithms - minimum spanning tree - Prim's and Kruskal's algorithms - Depth-first traversal - biconnectivity - Euler circuits - applications of graphs

**Total: 45 PERIODS**

**TEXT BOOK**

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Second Edition , Pearson Education, 2005.

**REFERENCES**

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, First Edition Reprint 2003.

2. R. F. Gilberg, B. A. Forouzan, "Data Structures", Second Edition, Thomson India Edition, 2005.

| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER V | 0 | 0 | 3 | 2 |

## POWER ELECTRONICS LAB

## (COMMON TO EEE,EIE)

**AIM:**

To study the characteristics of switching devices and its applications in rectifier, inverter, chopper, resonant converter and drives.

**LIST OF EXPERIMENTS:**

1. Characteristics of SCR& TRIAC
2. Characteristics of MOSFET and IGBT
3. AC to DC Half & fully controlled converter
4. IGBT based choppers
5. Voltage Commutated Chopper
6. IGBT based PWM inverter
7. Resonant dc to dc converter
8. AC Voltage Controller
10. Single Phase Cyclo-converter
11. Converter fed DC Motor Drive.
12. Inverter fed Induction Motor Drive.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1."Power Electronics Lab Manual" Prepared by Department of Electrical and Electronics Engineering prepared by AVIT&VMKVEC,Vinayaka Missions University

2. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.



3. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters,applications and design", John wiley and Sons, 3rd Edition, 2006.

4. O.P Aroa, "Power Electronics Laboratory" Narosa Publications 2007, Theory, Practicals Organization.

| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER V | 0 | 0 | 3 | 2 |

## CONTROL SYSTEMS LAB

## (COMMON TO EEE & MECHATRONICS)

**1. Transfer function of self and separately excited DC Generator.**

Aim : To determine the transfer function of self and separately excited DC generator.

**2. Transfer function of Armature and Field controlled DC Motor.**

Aim : To determine the transfer function of armature and field controlled DC motor.

**3. Transfer function of AC Servomotor.**

Aim : To derive the transfer function of the given A.C Servomotor and experimentally determine the transfer function parameters.

**4. Frequency response of Lag, Lead & Lag - Lead networks.**

Aim : To obtain the Frequency response of Lag, Lead & Lag - Lead networks.

**5. Study of Synchros and DC Stepper Motor**

Aim : To study the working of Synchros & stepper motor

**6. Transfer function of Ward - Leonard method of speed control of DC motor.**

Aim : To determine the transfer function parameters of Ward - Leonard method of speed control of DC motor.

**7. Study of DC Position Control system and study of various transducers**

Aim : To study the DC position control system and draw the error characteristics between setpoint and error and to study the various Transducers.

**8. Study of P, PI and PID Controllers (First Order).**

Aim : To determine the Time Response characteristics of the controllers.



**9. Analog and simulation of type - o and type - 1 systems**

Aim: To simulate the time response characteristics of I order and II order, type 0 and type-1 systems.

**10. Stability analysis of Linear Systems**

Aim : To analyse the stability of linear systems using Bode / Root locus / Nyquist plot.

**11. Digital simulation of first order systems**

Aim : To digitally simulate the time response characteristics of first -order system

**12.Digital simulation of second order systems**

Aim : To digitally simulate the time response characteristics of second -order system

**Total Hours : 45**

| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER V | 0 | 0 | 4 | 2 |

## LINEAR INTEGRATED CIRCUITS LAB

**AIM:**

To provide the ability to design simple linear integrated circuits using op-amp and other special purpose registers.

**OBJECTIVE:**

- To study the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To know the applications of special purpose integrated circuits eg: 555 timer

**List of Experiments:**

**Design and Testing of**

1. Inverting, Non inverting and differential amplifiers using Op Amp.
2. Integrator and Differentiator using Op Amp.
3. Instrumentation amplifier using Op Amp
4. Active Low Pass, High Pass and Band Pass filters using Op Amp.
5. Astable & Monostable Multivibrators and Schmitt Trigger using Op Amp.
6. Phase shift and Wien Bridge Oscillators using op-amp.
7. Astable and Monostable Multivibrators using NE555 Timer.
8. PLL characteristics and its use as Frequency Multiplier.
9. DC power supply using LM317 and LM723.
10. Study of SMPS.



| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER VI | 3 | 0 | 0 | 3 |

## MEASUREMENTS AND INSTRUMENTATION

**AIM**

To provide adequate knowledge in Electrical and electronic measurements and instrumentation

**OBJECTIVES**

i. To make the students to gain a clear knowledge of the fundamental elements of an instrument and static and dynamic characteristics.

ii. Emphasis is laid on the meters used to measure current & voltage and instrument transformers.

iii. To have an adequate knowledge in the measurement techniques for power and energy meters are included.

iv. To have basic knowledge about output display devices.

v. Elaborate discussion about transducer and its classification.

**1. INTRODUCTION 6**

Functional elements of an instrument - static and dynamic characteristics - errors in measurement - statistical evaluation of measurement data - standard and calibration.

**2. ELECTRICAL AND ELECTRONICS INSTRUMENTS 12**

Principle and types analog and digital ammeters and voltmeters - single and three phase Wattmeters and Energy meter- instrument transformers - instruments for measurement of frequency and phase.

**3. SIGNAL CONDITIONING CIRCUITS 9**

Bridge circuits - differential and Instrumentation amplifiers - filter circuits - V/f and f/V converters - A/D and D/A converters - multiplexing and demultiplexing - data acquisition systems - grounding techniques.

**4. STORAGE AND DISPLAY DEVICES 8**

Magnetic disc and tape recorders - digital plotters and printers - CRT displays - digital CRO - LED, LCD and Dot matrix displays. Data Logger

**5. TRANSDUCERS 10**

Classification of transducers - selection of transducers - resistive, capacitive and inductive transducers - piezo electric transducers - optical and digital transducers. - transducers for measurement of displacement, temperature, level, flows, pressure, velocity, torque, speed. Smart sensor.

**Total Hours = 45**

**TEXT BOOKS**

1. Doebeling, E.O., 'Measurement Systems - Application and Design', McGraw Hill Publishing Company, 1990.

2. H.S. Kalsi, 'Electornic Instrumentation', TMH Co., 1995.

**REFERENCES**

1. John P. Bentley, 'Principles of Measurement Systems', III Edition, Pearson Education, 2000.

2. Stout M.B., 'Basic Electrical Measurement', Prentice Hall of India, 1986.

3. Dalley, J.W., Riley, W.F. and Meconnel, K.G., 'Instrumentation for Engineering Measurement', John Wiley & Sons, 1993

4. Moorthy, D.V.S., 'Transducers and Instrumentation', Prentice Hall of India Pvt. Ltd., 1995.



| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER VI | 3 | 0 | 0 | 3 |

## MICROPROCESSORS AND MICRO CONTROLLERS

**AIM**

Enable students to understand different types of microprocessors and micro controllers and to use microprocessor and microcontroller for different applications.

**OBJECTIVES**

- To learn the concepts of basic microprocessors.
- To get knowledge in interfacing devices.
- To know the concepts of microcontroller and its applications.
- To develop skill in simple program writing.

**UNIT I INTEL 8085 MICROCPROCESSOR 9**

Evolution of microprocessors- 8085-microprocessor architecture -addressing modes- Instruction set - Memory interfacing -Basic timing diagram- interrupts - Software Interrupts - Data transfer schemes simple programs.

**UNIT II PERIPHERAL INTERFACING 9**

Programmable Peripheral Interface 8255 - Programmable Communication Interface 8251 USART - Programmable Interrupt Controller 8259A - Programmable Interval Timer 8253 - Keyboard/ Display Controller 8279 - DMA Controller 8237 - Floppy Disk Controller 8272- CRT Controller 8275.

**UNIT III INTEL 8086/8088 MICROPROCESSOR 9**

Architecture of 8086/8088-Register organization - Signal Description of 8086 - Minimum mode - Maximum mode and timings - 8086 Instruction set - Addressing modes - Assembler directives and operators- simple programs.

**UNIT IV 8031/8051 MICROCONTROLLER 9**

Single chip microcontroller - Introduction to 8 bit microcontroller - architecture of 8031/8051- Signal descriptions of 8051- Register set of 8051 operational features of 8051- Memory and I/O Interfacing-Interrupts -Instruction set - addressing mode -simple programs

**UNIT V INTERFACING 9**

Microprocessor based process control system - microcomputer based scale - interfacing alphanumeric displays, keyboard interface-speed control of stepper motor - high power devices interfacing - A/D and D/A interfacing.

**TOTAL PERIODS: 45**

**TEXTBOOKS**

1. Ramesh S.Gaonkar Microprocessor architecture, programming and its application with 8085, Penram Int. Pub. (India) IV edition.

2. A.K Roy, K.M Bhurchandi, Intel Microprocessors Architecture, Programming and Interfacing McGraw Hill International Edition - 20001

3. Muhammad Ali Mazidi and Janica Gilli Mazidi, The 8051 microcontroller and embedded systems , Pearson Education, 5th Indian reprint, 2003

**REFERENCE BOOKS**

1. Rafiquzzaman M. - Microprocessors - Theory and Applications Intel and Motorola , PHI Pvt. Ltd. , New Delhi 2001.

2. Douglas V.Hall - Microprocessors and Interfacing programming and hardware , Tata McGraw Hill Edition 1997.



| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER VI | 3 | 0 | 0 | 3 |

**FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING**

**AIM**

To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

**OBJECTIVES**

- To classify signals and systems & their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about multi rate signal processing

**UNIT I-DISCRETE TIME SIGNALS AND SYSTEMS 9**

Analysis of discrete time linear shift invariant systems - Convolution sum- Discrete-time systems described by difference equations- Implementation of discrete time systems - Z-transform and system analysis.

**UNIT II -DISCRETE TIME FOURIER TRANSFORM (DTFT) 9**

DFT and properties - computation of DFT and IDFT using Fast Fourier Transform (FFT), radix-2 DIT and DIF algorithms

**UNIT III - STRUCTURES FOR FIR SYSTEMS 9**

Direct, cascade, frequency sampling and lattice structures - Structures for IIR systems: direct, cascade, parallel and lattice structures- Representation of numbers - Quantization of filter coefficients - Round-off effects in digital filters.

**UNIT-IV DIGITAL FILTERS 9**

Design of linear phase FIR filters using window methods, fre-

quency sampling method - Design of IIR filters from analog filters, Frequency transformation.

**UNIT V MULTIRATE SIGNAL PROCESSING 9**

Multirate Digital Signal Processing, Sampling rate conversion - Sub-band coding of speech signals - Musical sound processing.

**L=45 T=15 TOTAL: 60 PERIODS**

**TEXT BOOK**

1. John G.Proakis and Dimitris G.Manolakis, "Digital Signal Processing Principles Algorithms and Applications, 3rd edition, Prentice Hall of India Pvt.Ltd. 2002.

**REFERENCES**

1. Sanjit K. Mitra, "Digital Signal Processing - A Computer based Approach", Tata McGraw Hill Edition, 2002.

2. Alan Oppenheim V., Ronald Schafer W., "Discrete Time Signal Processing", Pearson Education India Pvt Ltd., New Delhi, 2002.



| YEAR III | | L | T | P | C |
|---|---|---|---|---|---|
| SEMESTER | VI | 3 | 1 | 0 | 4 |

## POWER SYSTEM ANALYSIS

**AIM**

To understand the necessity and to become familiar with the modelling of power system and components. And to apply different methods to analyse power system for the purpose of system planning and operation.

**OBJECTIVES**

i To model the power system under steady state operating condition.

ii. To study the power flow models and apply efficient numerical methods to solve the power flow problem.

iii. To model and analyse the power systems under abnormal (or) fault conditions.

iv. To model and analyse the transient behaviour of power system when it is subjected to a fault.

v. To the study the Importance of stability analysis in power system planning

**UNIT I INTRODUCTION 9**

Modern power system (or) electric energy system - Analysis for system planning and operational studies - basic components of a power system. Generator models Transformer model transmission system model - load representation. Single line Diagram - per phase and per unit representation - change of base. Simple building algorithms for the formation of Y-Bus matrix and Z-Bus matrix.

**UNIT II POWER FLOW ANALYSIS 9**

Importance of power flow analysis in planning and operation of power systems. Statement of power flow problem - classification of buses into P-Q buses, P-V (voltagecontrolled) buses and slack bus. Development of Power flow model in complex variables

form and polar variables form. Iterative solution using Gauss-Seidel method including Q-limit check for voltagecontrolled buses - algorithm and flow chart. Iterative solution using Newton-Raphson (N-R) method (polar form) including Q-limit check and bus switching for voltage-controlled buses - Jacobian matrix elements - algorithm and flow chart. Development of Fast Decoupled Power Flow (FDPF) model and iterative solution - algorithm and flowchart; Comparison of the three methods.

**UNIT III FAULT ANALYSIS - BALANCED FAULTS 9**

Importance short circuit (or) for fault analysis - basic assumptions in fault analysis of power systems. Symmetrical (or) balanced three phase faults - problem formulation - fault analysis using Z-bus matrix - algorithm and flow chart. Computations of short circuit capacity, post fault voltage and currents.

**UNIT IV FAULT ANALYSIS - UNBALANCED FAULTS 9**

Introduction to symmetrical components - sequence impedances - sequence networks - representation of single line to ground, line to line and double line to ground fault conditions. Unbalanced fault analysis - problem formulation - analysis using Z-bus impedance matrix - (algorithm and flow chart.).

**UNIT V STABILITY ANALYSIS 9**

Importance of stability analysis in power system planning and operation - classification of power system stability - angle and voltage stability - simple treatment of angle stability into small-signal and large-signal (transient) stability Single Machine Infinite Bus (SMIB) system: Development of swing equation - equal area criterion - determination of critical clearing angle and time by using modified Euler method and Runge-Kutta second order method. Algorithm and flow chart.

**TEXT BOOKS**

1. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Publishing Company, New Delhi, 2002.



2. Olle. I. Elgerd, 'Electric Energy Systems Theory - An Introduction', Tata McGraw Hill Publishing Company Limited, New Delhi, Second Edition, 2003.

**REFERENCES**

1. P. Kundur, 'Power System Stability and Control, Tata McGraw Hill, Publications,1994.

2. John J. Grainger and W.D. Stevenson Jr., 'Power System Analysis', McGraw Hill International Book Company, 1994.

3. I.J. Nagrath and D.P. Kothari, 'Modern Power System Analysis', Tata McGraw-Hill Publishing Company, New Delhi, 1990.

4. K.Nagasarkar and M.S. Sukhija Oxford University Press, 2007

| YEAR III | L | T | P | C |
|---|---|---|---|---|
| SEMESTER VI | 3 | 0 | 0 | 3 |

## MATHEMATICAL MODELLING AND SIMULTION

### UNIT I MATLAB ENVIRONMENT 9

Defining Variables - functions - Matrices and Vectors -Strings - Input and Output statements -Script files - Arrays in Mat lab - Addressing Arrays - Dynamic Array - Cell Array - Structure Array - File input and output - Opening & Closing - Writing & Reading data from files.

### UNIT II PROGRAMMING IN MATLAB 9

Relational and logical operators - Control statements IF-END, IF-ELSE - END, ELSEIF, SWITCH CASE - FOR loop - While loop - Debugging - Applications to Simulation miscellaneous MAT lab functions & Variables.

### UNIT III PLOTTING IN MATLAB 9

Basic 2D plots - modifying line styles - markers and colors - grids - placing text on a plot - Various / Special Mat Lab 2D plot types - SEMILOGX - SEMILOGY - LOG- LOG - POLAR - COMET - Example frequency response of filter circuits.

### UNIT IV APPLICATION OF MATLAB 9

Linear algebric equations - elementary solution method - matrix method for linear equation - Cramer's method - Statistics, Histogram and probability - normal distribution - random number generation - Interpolation - Analytical solution to differential equations - Numerical methods for differential equations.

### UNIT V TOOL BOXES 9

Simulink - Simulink model for a dead zone system, nonlinear system - Applications in DSP - Computation of DFT & FFT - Filter structure -IIR & FIR filter design - Applications in Communication PCM, DPCM, DM, DTMFInterfacing of Matlab with event driven simulators.



### TEXT BOOKS:

1. Rudra Pratap,Getting Started with MATLAB6.0, 1st Edition, Oxford University Press, 2004.

### REFERENCE BOOKS:

1. William J.Palm,Introduction to MATLAB 6.0 for Engineers, Mc Graw Hill & Co

2. M.Herniter, Programming in MATLAB, Thomson Learning.

3. John G.Proakis, Digital Signal Processing using MATLAB, Thomson Learning.

| YEAR III | L | T | P | C |
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| SEMESTER VI | 0 | 0 | 4 | 2 |

## MEASUREMENTS AND INSTRUMENTATION LAB

**List of Experiments**

1. Study of temperature measuring transducers (Thermocouples).
2. Study of displacement and pressure transducers (LVDT).
3. AC Bridges.
4. DC Bridges.
5. Instrumentation amplifiers..
6. A/D and D/A converters.
7. Study of Transients.
8. Torque and angle measurement.
9. Calibration of Single phase Energy meter.
10. Calibration of Three phase Energy meter.
11. Measurement of Three phase power and power factor.



| YEAR III | L | T | P | C |
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## MICROPROCESSORS & MICROCONTROLLERS LAB

**AIM**

To provide the knowledge of assembly language programming of microprocessors and microcontrollers and interfacing peripheral devices with microprocessors.

**OBJECTIVE**

♦ To write the assembly language program for 8085, 8086 and 8051.

♦ To write the programs for communication between microprocessor and peripheral devices.

♦ To interface ADCs, DACs with microprocessor and learn the real time applications like stepper motor control, key board etc

**LIST OF EXPERIMENTS**

1. 8085 Assembly language Program (ALP) to add and subtract two 8 bit numbers.

2. 8085 Assembly language Program (ALP) to multiply and divide two 8 bit numbers.

3. 8085 Assembly language Program (ALP) to arrange the numbers in ascending and descending order.

4. 8086 Assembly language Program (ALP) to add and subtract two 8 bit numbers.

5. 8086 Assembly language Program (ALP) to multiply and divide two 8 bit numbers.

6. Interfacing a stepper motor to 8085 processor and operate it in clockwise and anti-clockwise directions.

7. Interfacing an ADC to 8085 processor and generate step, ramp, triangle and square waveforms.

8. Interfacing a keyboard to 8085 microprocessor and display the key number pressed on the 7- segment display.

9. 8051 Assembly language Program (ALP) to add and subtract two 8-bit numbers.

10. 8051 Assembly language Program (ALP) to multiply and divide two 8 bit numbers.



| YEAR III | L | T | P | C |
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| SEMESTER VI | 0 | 0 | 4 | 2 |

## MATHEMATICAL MODELLING AND SIMULTION LAB

**1. Introduction**

a. Launching Matlab & doing simple calculations

b. Creation & working with arrays & vectors

c. Plot simple graphs

d. Write and execute a script file

**2. Interactive Computation**

a. Matrices and Vectors

b. Matrix and array operations

c. Using In - Line functions

d. Write and execute a script file

e. Saving and loading data

**3. Programming in Mat Lab**

a. Script files

b. Function files

c. Language specific features

d. Advanced Data Objects

**4. Applications**

a. Linear Algebra

b. Curve fitting and interpolation

c. Data analysis & statistics

d. Numerical integration

e. Non Linear Algebra

**5. Graphics**

a. Basic 2-d plots

b. Using subplots to lay out multiple graphs

c. 3- d plots

**II. Simulink:**

1. Idea about simulink,
2. Problems based on simulink.



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| YEAR IV | | L | T | P | C |
| SEMESTER | VII | 3 | 0 | 0 | 3 |

## POWER SYSTEM OPERATION AND CONTROL

**AIM**

To become familiar with the preparatory work necessary for meeting the next day's power system operation and the various control actions to be implemented on the system to meet the minute-to-minute variation of system load.

**OBJECTIVES:**

(i) Have an overview of system load variation, reserve requirements, operation and control of power system.

(ii) Give an insight into the role of speed governing mechanism in load frequency control, concept of control area, modeling and analysis of load frequency control loop.

(iii) Give knowledge of excitation systems and the methods of voltage control.

(iv) Study the economic dispatch of generated power.

(v) Provide adequate knowledge of the functions of energy control center, SCADA system and the security control.

**UNIT I: INTRODUCTION 9**

System load - variation - load characteristics - load curves and load-duration curve (daily, weekly and annual) - load factor - diversity factor. Importance of load forecasting and simple techniques of forecasting. An overview of power system operation and control and the role of computers in the implementation. (Qualitative treatment with block diagram).

**UNIT II: REAL POWER - FREQUENCY CONTROL9**

Basics of speed governing mechanism and modeling - speed-load characteristics - load sharing between two synchronous machines in parallel. Control area concept LFC control of a single-area system. Static and dynamic analysis of uncontrolled and con-

trolled cases. Integration of economic dispatch control with LFC. Two-area system - modeling - static analysis of uncontrolled case - tie line with frequency bias control of two-area system - state variable model.

**UNIT III: REACTIVE POWER-VOLTAGE CONTROL 9**

Basics of reactive power control. Excitation systems - modeling. Static and dynamic analysis - stability compensation - generation and absorption of reactive power. Relation between voltage, power and reactive power at a node - method of voltage control - tapchanging transformer. System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

**UNIT IV: COMMITMENT AND ECONOMIC DISPATCH 9**

Statement of economic dispatch problem - cost of generation - incremental cost curve - co-ordination equations without loss and with loss, solution by direct method and λ- iteration method. (No derivation of loss coefficients).Statement of Unit Commitment problem - constraints; spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints. Solution methods - Priority-list methods - forward dynamic programming approach. Numerical problems only in priority-list method using full-load average production cost.

**UNIT V: COMPUTER CONTROL OF POWER SYSTEMS 9**

Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration - SCADA and EMS functions. Network topology - state estimation - security analysis and control. Various operating states (Normal, alert, emergency, in-extremis and restorative). State transition diagram showing various state transitions and control strategies.



**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.

2. Chakrabarti & Halder, "Power System Analysis: Operation and Control", Prentice Hall of India, 2004 Edition.

**REFERENCE BOOKS**

1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003. (For Chapters 1, 2 & 3)

2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

3. Hadi Saadat, "Power System Analysis", (For the chapters 1, 2, 3 and 4)11th Reprint 2007.

4. P.Kundur, 'Power System Stability and Control' MC Craw Hill Publisher, USA, 1994.

5. Olle.I.Elgerd, 'Electric Energy Systems theory an introduction' Tata McGraw Hill Publishing Company Ltd. New Delhi, Second Edition 2003.

| YEAR IV | L | T | P | C |
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| SEMESTER VII | 3 | 1 | 0 | 4 |

## HIGH VOLTAGE ENGINEERING

**AIM**

(i) To expose the students to causes and various types of over voltage Transients in Power system and its effects on power system.

(ii) To understand the Generation of over voltages in Laboratory.

(iii) To know about the Testing of power apparatus and system.

**OBJECTIVES**

(i) To understand the various types of over voltages in power system and protection.

(ii) Generation of over voltages in laboratories.

(iii) Measurement of overvoltage.

(iv) Nature of Breakdown mechanism in Solids.

(v) Testing of Power apparatus and insulation coordination.

**Unit I OVER VOLTAGES AND INSULATION COORDINATION 6**

Natural causes of over voltages-Lightning phenomena-Over voltages due to switching surges -System faults and other abnormal conditions-Principles of insulation co-ordination.

**Unit II ELECTRICAL BREAKDOWN IN SOLIDS 12**

Classical gas laws- Ionization and decay process- Secondary effects- Paschen's law-Streamer theory- Breakdown in non-uniform fields and corona discharges- Electromechanical breakdown-Thermal breakdown- Breakdown in composite dielectrics.

**Unit III GENERATION OF HIGH VOLTAGE AND HIGH CURRENT 9**

Generation of high DC voltage, alternating voltage , impulse voltage and impulse currents.



**Unit IV MEASUREMENT OF HIGH VOLTAGE AND HIGH CURRENT 9**

Measurement of high voltages and high currents - Digital techniques in high voltage measurement.

**Unit V HIGH VOLTAGE TESTING 9**

High voltage testing of electrical power apparatus - Power frequency, Impulse voltage and DC, International and Indian Standards.

**L: 45 T: 15 TOTAL: 60 PERIODS**

**TEXT BOOKS**

1. M. S. Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill,1995.

2. Kuffel,E and Zaengl, W.S, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford , Londan,1986

**REFERENCE BOOKS**

1. Kuffel, E and Abdullah..M, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford ,Londan,1970.

2. Gallghar, P.J and Pearmain,A.J., 'High Voltage Measurement',Testing and Design,John Wiley and Sons, Newyork,1982

| YEAR IV | | L | T | P | C |
|---|---|---|---|---|---|
| SEMESTER | VII | 3 | 1 | 0 | 4 |

## SOLID STATE DRIVES

### AIM

To study and understand the operation of electrical machines controlled by a power electronic converter and to introduce the controller design concepts.

### OBJECTIVES

- To understand steady state operation and transient dynamics of a motor load system.
- To study and analyze the operation of the converter / chopper fed dc drive, both qualitatively and quantitatively.
- To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.
- To study and understand the operation and performance of AC Induction motor drives.
- To study and understand the operation and performance of AC Synchronous motor drives.

### UNIT I DRIVE CHARACTERISTICS 12

Equations governing motor load dynamics - steady state stability - Multi quadrant dynamics - Acceleration, deceleration, starting and stopping - load torque characteristics of various drives.

### UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 12

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive - Continuous and discontinuous conduction Time ratio and current limit control - 4 quadrant operation of converter.

### UNIT III DESIGN OF CONTROLLERS FOR DRIVES 12

Transfer function for DC motor, load and converter - Closed



loop control with current and speed feedback - Armature voltage control and field weakening mode control, Design of controllers: Current controller and speed controller - Converter selection and characteristics -Use of simulation software package.

### UNIT IV INDUCTION MOTOR DRIVES 12

Stator voltage control - energy efficient drive - v/f control, constant air-gap flux - field weakening mode - voltage/current fed inverters - Block diagram of vector control - closed loop control.

### UNIT V SYNCHRONOUS MOTOR DRIVES 12

V/f control and self-control of synchronous motor - Marginal angle control and power factor control - Permanent magnet synchronous motor Black diagram of closed loop control.

**L: 45 T: 15 TOTAL: 60 PERIODS**

### TEXT BOOKS:

1. Gopal K.Dubey, "Fundamentals of Electrical Drives", Narosa Publishing House, 1992.

2. Bimal K.Bose. "Modern Power Electronics and AC Drives", Pearson Education, 2002.

### REFERENCES:

1. S.K.Pillai, "A First course on Electrical Drives", Wiley Eastern Limited, 1993.

2. Murphy J.M.D and Turnbull, "Thyristor Control of AC Motor", Pergamon Press, Oxford 1988.

3. Gopal K.Dubey, "Power semiconductor controlled Drives:, Prentice Hall Inc., New Jersey, 1989.

4. R.Krishnan, "Electric Motor & Drives: Modeling, Analysis and Control", Prentice hall of India, 2001.

| YEAR IV | L | T | P | C |
|---|---|---|---|---|
| SEMESTER VII | 3 | 0 | 0 | 3 |

## PROTECTION AND SWITCHGEAR

**AIM:**

To understand the various protection schemes in electrical system, theory of arc interruption and operation of various circuit breakers.

**OBJECTIVE:**

1. To study the basic principles, construction and operation of various protection relays.

2. To understand the protection schemes of various electrical equipments and application of CTS and PTS.

3. To study the theory of arc phenomena and arc interruption.

4. To understand construction, operation and capacitive merits of various types of circuit breakers.

5. To study protection schemes against over voltages.

### 1. RELAYS -PRINCIPLES &OPERATION 9

Need for protection - relay terminology - definitions - zones of protection - essential qualities of protective relays. Over current relays directional, distance and differential, under frequency, negative sequence relays - static relays - microprocessor-based relays.

### 2. APPARATUS PROTECTION 9

Apparatus Protection - generator and Transformer Protection, Protection of bus bars, transmission lines, CT's & PT's and their application in protective schemes.

### 3. THEORY ARC QUENCHING 9

Theory of arcing and arc quenching - RRRV - Current Chopping and Capacitive Current breaking - D.C. circuit breaking.

### 4. CIRCUIT BREAKERS 9

Switchgear - fault clearing and interruption of current - various types of circuit breakers - selection of circuit breakers - testing of circuit breakers- intelligent circuit breakers



### 5. PROTECTION AGAINST OVERVOLTAGES 9

Protection against over voltages due to lightning and switching - arcing grounds -Peterson coil - ground wires - surge absorber and diverters Power system earthing - neutral earthing - basic ideas of insulation coordination

**Total Hours: 45 PERIODS**

**TEXT BOOKS**

1. Veerappan.N and Krishnamurthi .S.R,' Power Systems Switch Gear and Protection' , S.Chand Edition 2009.

2. Ravindranath, B and Chander, N, 'Power System Protection and Switchgear', Wiley Eastern Ltd., 1977.

3. Chakrabarti .A, Soni .M.L, Gupta .P.V, 'A text book on power system Engineering', Dhanpat rai & Co. pvt. Ltd., 1998.

**REFERENCE BOOKS**

1. Wadhwa, C.L., 'Electrical Power Systems', New Age International (P) Ltd., Publishers, 1995.

2. Patra, S.P., Basu , S.K. and Chowduri, S., 'Power systems Protection', Oxford and IBH Publishing Co, 1983.

3. Sunil.S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 1986

| YEAR IV | L | T | P | C |
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| SEMESTER VII | 3 | 0 | 0 | 3 |

## ENGINEERING MANAGEMENT AND ETHICS

(COMMON TO ALL BRACH)

### UNIT I PLANNING 9

Nature and purpose of planning - Planning process - Types of plans - Objectives Managing by objective (MBO) Strategies - Types of strategies - Policies - Decision Making - Types of decision - Decision Making Process - Rational Decision Making Process - Decision Making under different conditions.

### UNIT II ORGANIZING 9

Nature and purpose of organizing - Organization structure - Formal and informal groups I organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages - Training - Performance Appraisal.

### UNIT III DIRECTING 9

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories - Communication - Barriers to effective communication - Organization Culture - Elements and types of culture - Managing cultural diversity.

### UNIT IV INTRODUCTION TO ETHICS 9

Moral dilemmas -Uses of Ethical Theories- Engineering As Social Experimentation- Engineer's Responsibility For Safety-Codes of Ethics-Challenger Case Study

### UNIT V ETHICS IN ENGINEERING 9

Employed Engineers Rights and Duties- Collective Bargaining-Occupational Crime- Global Issues- Multinational Corporation-Technology transfer-Engineers as managers-Consulting Engineers-Expert Witness-Moral Leadership



**TOTAL:45 HOURS**

### TEXT BOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.

2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.

3. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).

### REFERENCES:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).

2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.

3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.

4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics - An Indian Perspective", Biztantra, New Delhi, (2004)

5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

| YEAR IV | L | T | P | C |
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| SEMESTER VII | 0 | 0 | 3 | 2 |

## MINI PROJECT

**OBJECTIVES:**

1. The students in batches (not exceeding three in a batch) have to take up a project in the area of their own interest related to their specialization .

2. Each batch is guided by a faculty member. The students have to select a suitable problems, design, prepare the drawings, produce the components, assemble and commission the project.

3. The students have to prepare and present a detailed project report at the end of the VI semester.

4. The evaluation will be made for the continuous internal assessment for the Project by a committee nominated by the Head of the Department.



| YEAR IV | L | T | P | C |
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## POWER SYSTEM SIMULATION LAB

**AIM**

To acquire software development skills and experience in the usage of standard packages necessary for analysis and simulation of power system required for its planning, operation and control.

**OBJECTIVES**

i. To develop simple C/MATLAB programs for the following basic requirements:

a) Formation of bus admittance and impedance matrices and network solution.

b) Power flow solution of small systems using simple method, Gauss-Seidel P.F. method.

c) Unit Commitment and Economic Dispatch.

ii. To acquire experience in the usage of standard packages for the following analysis / simulation / control functions.

**LIST OF EXPERIMENTS**

1. Computation of Parameters and Modelling of Transmission Lines

2. Formation of Network Matrices and Solution of Networks.

3. Power Flow Analysis - I: Solution of Power Flow and Related Problems Using Gauss-Seidel Method.

4. Power Flow Analysis II: Solution of Power Flow and Related Problems Using Newton-Raphson and Fast-Decoupled Methods.

5. Short Circuit Analysis.

6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System.

7. Transient Stability Analysis of Multimachine Power Systems.

8. Electromagnetic Transients in Power Systems.

9. Load - Frequency Dynamics of Single and Two-Area Power Systems.

10. Unit Commitment and Economic Dispatch in Power Systems.

**TOTAL : 45 PERIODS**



| YEAR IV | | L | T | P | C |
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| SEMESTER | VII | 0 | 0 | 12 | 6 |

## PROJECT WORK & VIVA VOCE

**OBJECTIVE**

- The objective of the project work is to enable the students to form the groups of not more than 3 members on a project involving theoretical and experimental studies related to the branch of study.
- Formation of Group as follows
- Group A : 8.5CGPA and above
- Group B : 7 to 8.49 CGPA
- Group C : 5 to 6.9 CGPA

Group A Student will have a choice to take 2 students from Group B&C

- Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.
- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
- The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.
- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.
- This final report shall be typewritten form as specified in the guidelines.
- The continuous assessment shall be made as prescribed in the regulations

ELECTIVES

| ELECTIVE | L | T | P | C |
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## ADVANCED CONTROL SYSTEM

## (COMMON TO EEE & EIE)

### UNIT I STATE VARIABLE ANALYSIS 9

Concept of state - State Variable and State Model - State models for linear and continuous time systems - Solution of state and output equation - controllability and\ observability - Pole Placement - State observer Design of Control Systems with observers.

### UNIT II PHASE PLANE ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities - Methods of linearising non-linear systems - Concept of phase portraits - Singular points - Limit cycles - Construction of phase portraits - Phase plane analysis of linear and non-linear systems - Isocline method.

### UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts, derivation of describing functions for common non-linearities - Describing function analysis of non-linear systems - Conditions for stability - Stability of oscillations.

### UNIT IV STABILITY ANALYSIS 9

Introduction - Liapunov's stability concept - Liapunov's direct method - Lure's transformation - Aizerman's and Kalman's conjecture - Popov's criterion - Circle criterion.

### UNIT V OPTIMAL CONTROL 9

Introduction -Decoupling - Time varying optimal control - LQR steady state optimal control - Optimal estimation - Multivariable control design.

**Total Hours: 45**



### TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

2. Ashish Tewari, 'Modern control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.

### REFERENCE BOOKS

1. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

2. M.Gopal, Modern control system theory, New Age International Publishers, 2002.

3. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, " Feedback Control of Dynamic Systems", Fourth edition, Pearson Education, Low price edition. 2002.

| ELECTIVE | L | T | P | C |
|---|---|---|---|---|
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## ADVANCED TOPICS IN POWER ELECTRONICS

### AIM

To study modern power electronic converters and its applications in electric power utility like low power SMPS and UPS technologies

### OBJECTIVE

- To study the operation, switching techniques and basics topologies of DC-DC switching regulators
- To understand the operation, characteristics and performance parameters of switching mode power converters.
- To study the operation of resonant converters and concept of Zero voltage Switching.
- To learn the concept and operation of Inverters and different modulation techniques of pulse width modulated inverters and to undest and harmonic reduction methods.
- To study the operation of various power electronics applications like UPS and filters.

### UNIT I DC-DC CONVERTERS 9

Principles of stepdown and stepup converters - Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters.

### UNIT II SWITCHING MODE POWER CONVERTERS 9

Analysis and state space modeling of flyback, Forward, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

### UNIT III RESONANT CONVERTERS 9

Introduction- classification- basic concepts- Resonant switch-



Load Resonant converters- ZVS , Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control .

### UNIT IV DC-AC CONVERTERS 9

Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters-Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

### UNIT V POWER CONDITIONERS, UPS & FILTERS 9

Introduction- Power line disturbances- Power conditioners - UPS: offline UPS, Online UPS, Applications - Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters - Design of inductor and transformer for PE applications - Selection of capacitors.

### TOTAL: 45 PERIODS

### TEXT BOOKS:

1. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters, Applications and design- Third Edition- John Wiley and Sons- 2006

2. M.H. Rashid - Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.

### REFERENCES:

1. M.H. Rashid - Power Electronics handbook, Elsevier Publication, 2001.

2. Kjeld Thorborg, "Power Electronics - In theory and Practice", Overseas Press, First Indian Edition 2005.

3. Philip T Krein, " Elements of Power Electronics", Oxford University Press

| ELECTIVE | L | T | P | C |
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## ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

## (COMMON TO EEE & EIE)

**Unit I - Introduction** **9**

Introduction to AI and problem solving concepts: Definition-pattern recognition-production systems - problem and production system characteristics - two-pail problem-analysis of AI techniques - criteria for success

**Unit II - Representation** **9**

Knowledge representation - formal and non-formal logic: Representation evaluation criteria -level of representation -formal logic schemes -resolutions -predicate and prepositional logic -conversion to clause form -semantic networks-frames-scripts-production system

**Unit III- Problem solving** **9**

Problem solving strategies dealing with uncertainty: Defining the problem - control strategies - exhaustive search - generate and test-space transformation models- forward versus backward reasoning -matching - weak methods - hill climbing -breadth and depth first searches - search algorithms.

**Unit IV- Expert System** **9**

Expert system development process and knowledge acquisition: Definition - analysis of expert system problem solving - role and analysis of knowledge - architecture of the expert system - problem selection - formalization -implementation -evaluation.

**Unit V- Knowledge acquisition** **9**

Knowledge acquisition techniques- cognitive behavior - knowledge representation development. Expert system tools: Expert system shells -narrow tools -large hybrid expert system tools -PC based expert system tools knowledge acquisition tools.



**TOTAL: 45 PERIODS**

**References**

Introduction to AI & Expert System - D. W. Patterson, Prentice hall of India

Principles of Artificial Intelligence& Expert Systems Development - David W.Rolston, Tata McGraw Hill

Artificial Intelligence - Elaine Rich, McGraw Hill

Principles of Artificial Intelligence - Nils J. Nilsson, Springer Verlag Introduction to Artificial Intelligence - Charnaik & McDermott, Addison Wesley

| ELECTIVE | L | T | P | C |
|---|---|---|---|---|
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## BIOMEDICAL INSTRUMENTATION

## (COMMON TO BME, EEE, EIE & MECHAT)

### AIM

To enable the students to develop knowledge of principles, design and applications of the Biomedical Instruments.

### OBJECTIVES

- Be able to list the problems associated with the acquisition of Bio potential and list the different types of electrodes.
- To know the various Biopotential recording methods
- To study about various Physiological measurements methods
- Be able to state the purpose, uses, principle of operation and maintenance of blood flow meter and blood cell counter
- Details the various bio chemical measurements and list the different types of Biosensors

### UNIT-I: BIO PONTENTIAL ELECTRODES AND TRANSDUCERS 9

Origin of Bioelectric signals, recording electrodes-Electrode Tissue interface, Electrolyte -skin interface, Polarization, Skin contact impedance, motionartifacts. Types of electrodes- surface, Needle electrodes and Micro electrodes, Recording problems, Transducers-characteristics and types.

### UNIT-II: BIOPOTENTIAL RECORDING 9

Need for Bio-amplifier, single ended bio amplifier, differential Bio amplifier, Right leg driven ECG amplifier, Band pass filtering, isolation DC amplifier & AC amplifier, chopper amplifier, Power line interface.ECG, EEG, EMG, PCG, EOG, ERG lead system and recording methods, typical waveform, frequency spectrum, abnormal waveform.



### UNIT III: NON ELECTRICAL PARAMETER MEASUREMENTS 9

Respiration rate, Pulse rate, Temperature, Blood Pressure, O2 , CO2 measurements, Respiratory volume measurement, BMR measurement, Plethysmography technique, Impedance technique- Bipolar and Tetra polar circuits, Detection of various physiological parameters using impedance technique.

### UNIT IV: BLOOD FLOW METER AND BLOOD CELL COUNTER 9

EM and ultrasonic blood flow meters, indicator dilution method, Thermo dilution method, Manual and Automatic Counting of RBC, WBC and Platelets.

### UNIT V: BIO-CHEMICAL MEASUREMENTS & BIOSENSORS 9

Ph, Pc02, p02, Phco3 and electrophoresis, colorimeter, spectrophotometer, flame photometer, autoanalyser, Biosensors.

### TOTAL HOURS: 45

### TEXT BOOKS

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.

2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.

### REFERENCE BOOKS.

1. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995

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## CAD FOR ELECTRICAL APPARATUS

### AIM

To introduce the basics of Computer Aided Design technology for the design of Electrical Machines.

### OBJECTIVE

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

1. Learn the importance of computer aided design method.

2. Understand the basic electromagnetic field equations and the problem formulation for CAD applications.

3. Become familiar with Finite Element Method as applicable for Electrical Engineering.

4. Know the organization of a typical CAD package.

5. Apply Finite Element Method for the design of different Electrical apparatus.

### UNIT I INTRODUCTION

Conventional design procedures - Limitations - Need for field analysis based design - Review of Basic principles of energy conversion - Development of Torque/Force.

### UNIT II MATHEMATICAL FORMULATION OF FIELD PROBLEMS

Electromagnetic Field Equations - Magnetic Vector/Scalar potential - Electrical vector Scalar potential - Stored energy in Electric and Magnetic fields - Capacitance - Inductance- Laplace and Poisson's Equations - Energy functional.

### UNIT III PHILOSOPHY OF FEM

Mathematical models - Differential/Integral equations - Finite Difference method - Finite element method - Energy minimization - Variational method- 2D field problems -Discretisation - Shape functions - Stiffness matrix - Solution techniques.



### UNIT IV CAD PACKAGES

Elements of a CAD System -Pre-processing - Modelling - Meshing - Material properties- Boundary Conditions - Setting up solution - Post processing.

### UNIT V DESIGN APPLICATIONS

Voltage Stress in Insulators - Capacitance calculation - Design of Solenoid Actuator - Inductance and force calculation - Torque calculation in Switched Reluctance Motor.

### TEXT BOOKS

1. S.J Salon, 'Finite Element Analysis of Electrical Machines', Kluwer Academic Publishers, London, 1995.

2. Nicola Bianchi, 'Electrical Machine Analysis using Finite Elements', CRC Taylor& Francis, 2005.

### REFERENCES

1. Joao Pedro, A. Bastos and Nelson Sadowski, 'Electromagnetic Modeling by Finite Element Methods', Marcell Dekker Inc., 2003.

2. P.P.Silvester and Ferrari, 'Finite Elements for Electrical Engineers', Cambridge University Press, 1983.

3. D.A.Lowther and P.P Silvester, 'Computer Aided Design in Magnetics', Springer Verlag, New York, 1986.

4. S.R.H.Hoole, 'Computer Aided Analysis and Design of Electromagnetic Devices', Elsevier, New York, 1989.

5. User Manuals of MAGNET, MAXWELL & ANSYS Software

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## COMPUTER ARCHITECTURE

## (COMMON TO CSE,IT,EEE MECHAT)

### UNIT I BASIC STRUCTURE OF COMPUTERS 9

Functional units - Basic operational concepts - Bus structures - Software performance - Memory locations and addresses - Memory operations - Instruction and instruction sequencing - Addressing modes - Assembly language - Basic I/O operations - Stacks and queues.

### UNIT II ARITHMETIC UNIT 9

Addition and subtraction of signed numbers - Design of fast adders - Multiplication of positive numbers - Signed operand multiplication and fast multiplication - Integer division - Floating point numbers and operations.

### UNIT III BASIC PROCESSING UNIT 9

Fundamental concepts - Execution of a complete instruction - Multiple bus organization - Hardwired control - Microprogrammed control - Pipelining - Basic concepts - Data hazards - Instruction hazards - Influence on Instruction sets - Data path and control consideration - Superscalar operation.

### UNIT IV MEMORY SYSTEM 9

Basic concepts - Semiconductor RAMs - ROMs - Speed - size and cost - Cache memories - Performance consideration - Virtual memory- Memory Management requirements - Secondary storage.

### UNIT V I/O ORGANIZATION 9

Accessing I/O devices - Interrupts - Direct Memory Access - Buses - Interface circuits - Standard I/O Interfaces (PCI, SCSI, USB).

**TOTAL : 45 PERIODS**



### TEXT BOOKS

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill, 2002.

### REFERENCES

1. William Stallings, "Computer Organization and Architecture - Designing for Performance", 6th Edition, Pearson Education, 2003.

2. David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002.

3. John P.Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw-Hill, 1998.

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## DESIGN OF ELECTRICAL APPARATUS

### 1. INTRODUCTION 9

Major considerations - Limitations - Electrical Engineering Materials - Space factor - temperature gradient - Heat flow in two dimensions - thermal resistivity of winding - Temperature gradient in conductors placed in slots - Rating of machines - Eddy current losses in conductors - Standard specifications

### 2. DC MACHINES 9

Magnetic circuit calculations - Net length of Iron -Real & Apparent flux densities - Design of rotating machines - D.C machines output equations - Selection of number of poles - Armature design - Design of commutator and brushes.

### 3. TRANSFORMERS 9

KVA output for single and three phase transformers - Window space factor - Overall dimensions - Operating characteristics - Regulation - No load current - Temperature rise of Transformers - Design of Tank with & without cooling tubes - Thermal rating - Methods of cooling of Transformers - Design of chokes - Design of welding Transformers - Design of CTs & PTs.

### 4. INDUCTION MOTORS 9

Magnetic leakage calculations - Leakage reactance of polyphase machines- Magnetizing current - Output equation of Induction motor - Main dimensions -Length of air gap- Rules for selecting rotor slots of squirrel cage machines - Design of rotor bars & slots - Design of end rings - Design of wound rotor-Operating characteristics -Short circuit current - circle diagram - Dispersion co-efficient - relation between D & L for best power factor.



### 5. SYNCHRONOUS MACHINES 9

Runaway speed - construction - output equations - choice of loadings - Design of salient pole machines - Short circuit ratio - shape of pole face - Armature design - Armature parameters - Estimation of air gap length - Design of rotor -Design of damper winding - Determination of full load field MMF - Design of field winding - Design of turbo alternators - Rotor design - Introduction to computer aided design - Program to design main dimensions of Alternators.

**Total Hours : 45**

### TEXT BOOKS

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.

2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

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## EHV AC & DIRECT CURRENT POWER TRANSMISSION

**AIM:**

i) To study the different types of AC and DC links with its advantages and applications

ii) To study the different compensation techniques

iii) To study the concept of travelling waves, types of over voltage in the transmission line

iv) To study the different components used in EHV system

**UNIT-I**

Constitution of EHV AC and DC links, Kinds of DC links, limitations and advantages of AC and DC transmission principal, application of AC and DC transmission , trends EHV AC and DC transmission, power-handling capacity converter analysis Garentz circuit, Firing control, overlapping.

**UNIT-II**

Extra long distance lines, voltage profile of loaded and unloaded line along the line, compensation of lines, series and shunt compensation, shunt reactors, Tuned power lines, problem of extra compensation lines, FACT concept and application.

**UNIT-III**

Travelling waves on transmission system, Their shapes, attenuation and distortion, effect of junction and termination on propagation of traveling waves, over voltage in transmission system, lighting, switching and temporary over voltage: control of lighting and switching over voltage.

**UNIT-IV**

Components of EHV dc system, converter circuits, rectifier



and inverter valves, Reactive power requierments, harmonic generation, adverse effects, classification, Remidial measures to suppress, ,filters, Ground return,converter faults& protection harmonics misoperation, commutation failure, Multi-terminal D,C. lines.

**UNIT-V**

Control of EHV DC system desired features of control ,control charactteristics, constants current control, constant extinction angle control, lgnition angle control, parallel operation of HVAC & DC system, problems and advantage

**TEXT BOOKS**

1. Rakesh Das Begmudre, Extra High Voltage AC Transmission Engineering, Wiley Estern Limited.

2. K.R. Padiyar, HVDC Power Transmission System, Wiley Estern Limited.

**REFERENCE BOOK**

1. E.W. Kimbark. EHV-AC and HVDC Transmission Engineering & Practice, Khanna Publishers.

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## FLEXIBLE AC TRANSMISSION SYSTEMS

**AIM:**

i) To study the different methods used to control the reactive power in transmission line

ii) To study the compensation technique for reactive control using static var compensator with its application

iii) To study about working principle, Different modes of operation and applicatiotns of thyristors controlled series capacitor

iii) To study the different voltage source converters based FACTS controllers

iv) To study the coordination of FACTS controller using different techniques

### 1. INTRODUCTION 9

Reactive power control in electrical power transmission lines - Uncompensated transmission line - series compensation - Basic concepts of static Var Compensator (SVC) - Thyristor Switched Series capacitor (TCSC) - Unified power flow controller (UPFC).

### 2. STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC - Advantages of slope in dynamic characteristics - Influence of SVC on system voltage - Design of SVC voltage regulator -Modelling of svc for power flow and transient stability - Applications: Enhancement of transient stability - Steady state power transfer - Enhancement of power system damping - Prevention of voltage instability.

### 3. THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC - Different modes of operation - Modelling of TCSC - Variable reactance model - Modelling for Power



Flow and stability studies. Applications: Improvement of the system stability limit - Enhancement of system damping-SSR Mitigation.

### 4. VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM) - Principle of operation - V-I Characteristics. Applications: Steady state power transfer-Enhancement of transient stability - Prevention of voltage instability. SSSC-operation of SSSC and the control of power flow -Modelling of SSSC in load flow and transient stability studies. Applications: SSR Mitigation-UPFC and IPFC

### 5. CO-ORDINATION OF FACTS CONTROLLERS 9

Controller interactions - SVC - SVC interaction - Co-ordination of multiple controllers using linear control techniques - Control coordination using genetic algorithms.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008

2. R.Mohan Mathur, Rajiv K.Varma, "Thyristor - Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, Inc

**REFERENCES**

1. R.Mohan Mathur, Rajiv K.Varma, "Thyristor - Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, Inc.

2. Narain G. Hingorani, "Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems", Standard Publishers Distributors, Delhi- 110 006

3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008

4. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.

5. V.K.Sood,HVDC and FACTS controllers - Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers.



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## HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

### AIM

To develop the skills in the area of HVDC power transmission with the analysis of HVDC converters.

### OBJECTIVE

i) To understand the concept, planning of DC power transmission and comparison with power transmission.

ii) To analyze HVDC converters

iii) To study about the multi-terminal DC systems.

iv) To analyze the power flow in AC/DC systems

v) To learn about HVDC simulation tools.

### 1. DC POWER TRANSMISSION TECHNOLOGY 6

Introduction - Comparison of AC and DC transmission - Application of DC transmission - Description of DC transmission system - Planning for HVDC transmission - Modern trends in DC transmission - DC breakers - Cables, VSC based HVDC.

### 2. ANALYSIS OF HVDC CONVERTERS AND HVDC SYSTEM CONTROL 12

Pulse number, choice of converter configuration - Simplified analysis of Graetz circuit - Converter bridge characteristics - characteristics of a twelve pulse converter detailed analysis of converters. General principles of DC link control - Converter control characteristics - System control hierarchy - Firing angle control - Current and extinction angle control - Generation of harmonics and filtering - power control - Higher level controllers.

### 3. MULTITERMINAL DC SYSTEMS 9

Introduction - Potential applications of MTDC systems - Types of MTDC systems - Control and protection of MTDC systems - Study of MTDC systems.

**4. POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9**

Per unit system for DC Quantities - Modelling of DC links - Solution of DC load flow -Solution of AC-DC power flow - Case studies.

**5. SIMULATION OF HVDC SYSTEMS 9**

Introduction - System simulation: Philosophy and tools - HVDC system simulation - Modeling of HVDC systems for digital dynamic simulation - Dynamic in traction between DC and AC systems.

**TOTAL : 45 PERIODS**

**TEXT BOOK**


1. K.R.Padiyar, , "HVDC Power Transmission Systems", New Age International (P) Ltd., New Delhi, 2002
2. J.Arrillaga, , "High Voltage Direct Current Transmission", Peter Pregrinus, London,1983.


**REFERENCE**


1. Edward Wilson Kimbark, " Direct current Transmission", Vol.I, Wiley interscience, New York,London, Sydney,1971.
2. P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
3. Erich Uhlmann, " Power Transmission by Direct Current", BS Publications, 2004.
4. V.K.Sood,HVDC and FACTS controllers - Applications of Static Converters in




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## INFORMATION SECURITY

## (COMMON TO ALL BRANCHES)

**AIM**

To study the critical need for ensuring Information Security in Organizations

**OBJECTIVES**

1. To understand the basics of Information Security
2. To know the legal, ethical and professional issues in Information Security
3. To know the aspects of risk management
4. To become aware of various standards in this area
5. To know the technological aspects of Information Security

**UNIT 1 INTRODUCTION 9**

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

**UNIT II SECURITY INVESTIGATION 9**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

**UNIT III SECURITY ANALYSIS 9**

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

**UNIT IV LOGICAL DESIGN 9**

Blueprint for Security, Information Security Poicy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA Inter-

national Security Model, Design of Security Architecture, Planning for Continuity

**UNIT V PHYSICAL DESIGN** **9**

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

**TOTAL : 45**

**TEXT BOOK**

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003

**REFERENCES**

1. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.

2. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003

3. Matt Bishop, " Computer Security Art and Science", Pearson/ PHI, 2002.



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## INTELLIGENT CONTROLLERS

## (COMMON TO EEE, EIE & MECHAT)

**UNIT I INTRODUCTION** **9**

Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.

**UNIT II ARTIFICIAL NEURAL NETWORKS** **9**

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and Training the neural network. Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations. Hopfield network, Self-organizing network and Recurrent network. Neural Network based controller

**UNIT III GENETIC ALGORITHM** **9**

Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other search techniques like tabu search and ant-colony search techniques for solving optimization problems.

**UNIT IV FUZZY LOGIC SYSTEM** **9**

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modeling and control schemes for nonlinear systems. Self-organizing fuzzy logic control. Fuzzy logic control for nonlinear time-delay system.

**UNIT V APPLICATIONS** **9**

GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic

systems using Matlab-Neural Network toolbox. Stability analysis of Neural-Network interconnection systems. Implementation of fuzzy logic controller using Matlab fuzzy-logic toolbox. Stability analysis of fuzzy control systems.

**TOTAL HOURS: 45**

**TEXT BOOKS**

1. Padhy.N.P.(2005), Artificial Intelligence and Intelligent System, Oxford University Press.

2. KOSKO,B. "Neural Networks And Fuzzy Systems", Prentice-Hall of India Pvt. Ltd., 1994.



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## MEMS

**(COMMON TO ECE, BME, EEE, EIE & MECHAT)**

**AIM**

To students to gain basic knowledge on MEMS (Micro Electro Mechanical System) and various fabrication techniques. This enables them to design, analyze, fabricate and test the MEMS based components.

**OBJECTIVES**

- Introduction to MEMS and micro fabrication
- To study the Mechanics for MEMS Design.
- To study Electro Static Design and System Issues.
- To know various MEMS Applications
- To know about the optical and RF MEMS

**UNIT I INTRODUCTION TO MEMS 9**

MEMS and Microsystems, Miniaturization, Typical products, Micro sensors, Micro actuation, MEMS with micro actuators, Micro accelorometers and Micro fluidics, MEMS materials, Micro fabrication

**UNIT II MECHANICS FOR MEMS DESIGN 9**

Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics - actuators, force and response time, Fracture and thin film mechanics.

**UNIT III ELECTRO STATIC DESIGN AND SYSTEM ISSUES 9**

Electrostatics: basic theory, electro static instability. Surface tension, gap and finger pull up, Electro static actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic

actuators. bistable actuators. Electronic Interfaces, Feedback systems, Noise, Circuit and system issues,

**UNIT IV MEMS APPLICATION 9**

Case studies - Capacitive accelerometer, Peizo electric pressure sensor, Microfluidics application, Modeling of MEMS systems, CAD for MEMS.

**UNIT V INTRODUCTION TO OPTICAL AND RF MEMS 9**

Optical MEMS, - System design basics - Gaussian optics, matrix operations, resolution. Case studies, MEMS scanners and retinal scanning display, Digital Micro mirror devices. RF Memes - design basics, case study - Capacitive RF MEMS switch, performance issues.

**TOTAL HOURS: 45**

**TEXT BOOK:**


1. Stephen Santeria," Microsystems Design", Kluwer publishers, 2000.
2. N.P.Mahalik, "MEMS",Tata McGraw hill, Sixth reprint, 2012.


**REFERENCES:**


1. Nadim Maluf," An introduction to Micro electro mechanical system design", ArtechHouse, 2000.

2. Mohamed Gad-el-Hak, editor," The MEMS Handbook", CRC press Baco Raton,2000.

3. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002. Liu,"MEMS", Pearson education, 2007.

5. James J.Allen, micro electro mechanical system design, CRC Press published in 2005




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**POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEM**

**1. INTRODUCTION 9**

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

**2. ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9**

Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

**3. POWER CONVERTERS 9**

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection Of inverter, battery sizing, array sizing Wind: three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

**4. ANALYSIS OF WIND AND PV SYSTEMS 9**

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG and SCIG Based WECSGrid Integrated solar system

**5. HYBRID RENEWABLE ENERGY SYSTEMS 9**

Need for Hybrid Systems- Range and type of Hybrid systems-Case studies of Wind PV Maximum Power Point Tracking (MPPT).

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Rashid .M. H "power electronics Hand book", Academic press, 2001.

2. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.

3. Rai. G.D," Solar energy utilization", Khanna publishes, 1993.

4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.

5. Non-conventional Energy sources B.H.Khan Tata McGraw-hill Publishing Company, New Delhi



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## POWER QUALITY

**AIM:**

To study the various issues affecting power quality, their production, monitoring and suppression.

**OBJECTIVES:**

i. To study the production of voltages sags, overvoltage's and harmonics and methods of control.

ii. To study various methods of power quality monitoring.

**UNIT I INTRODUCTION TO POWER QUALITY 9**

Terms and definitions: Overloading - under voltage - over voltage. Concepts of transients - short duration variations such as interruption - long duration variation such as sustained interruption. Sags and swells - voltage sag - voltage swell - voltage imbalance - voltage fluctuation - power frequency variations. International standards of power quality. Computer Business Equipment Manufacturers Associations (CBEMA) curve.

**UNIT II VOLTAGE SAGS AND INTERRUPTIONS 9**

Sources of sags and interruptions - estimating voltage sag performance. Thevenin's equivalent source - analysis and calculation of various faulted condition. Voltage sag due to induction motor starting. Estimation of the sag severity - mitigation of voltage sags, active series compensators. Static transfer switches and fast transfer switches.

**UNIT III OVERVOLTAGES 9**

Sources of over voltages - Capacitor switching - lightning - ferro resonance. Mitigation of voltage swells - surge arresters - low pass filters - power conditioners. Lightning protection - shielding - line arresters - protection of transformers and cables. An introduction to computer analysis tools for transients, PSCAD and EMTP.

**UNIT IV HARMONICS** **9**

Harmonic sources from commercial and industrial loads, locating harmonic sources. Power system response characteristics - Harmonics Vs transients. Effect of harmonics - harmonic distortion -voltage and current distortion - harmonic indices - inter harmonics - resonance. Harmonic distortion evaluation - devices for controlling harmonic distortion - passive and active filters. IEEE and IEC standards.

**UNIT V POWER QUALITY MONITORING** **9**

Monitoring considerations - monitoring and diagnostic techniques for various power quality problems - modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - power line disturbance analyzer - quality measurement equipment - harmonic / spectrum analyzer - flicker meters - disturbance analyzer. Applications of expert systems for power quality monitoring.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power

Systems Quality' McGraw Hill,2003.(For Chapters1,2,3, 4 and 5)

**REFERENCES:**

1. G.T. Heydt, 'Electric Power Quality', 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)

2. M.H.J Bollen, 'Understanding Power Quality Problems: Voltage Sags and Interruptions', (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)

3. J. Arrillaga, N.R. Watson, S. Chen, 'Power System Quality Assessment', (New York: Wiley, 1999). (For Chapters 1, 2, 3, 4 and 5)

4. PSCAD User Manual



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**POWER SYSTEM PLANNING AND RELIABILITY**

**AIM:**

To make students become familiar with power system operation and the various control actions to be implemented on the power system for reliability

**OBJECTIVES:**

i) To introduce the students ves of power system

ii) To make the students learn the reliability stability analysis of generation in power system

iii) To make the students learn the reliability stability analysis of transmission in power system

iv) To familiarize the students with the planning of expansion of power system

v) To introduce the students with the overview of planning of distribution system

**UNIT I LOAD FORECASTING** **9**

Objectives of forecasting - Load growth patterns and their importance in planning - Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

**UNIT II GENERATION SYSTEM RELIABILITY ANALYSIS** **9**

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served -Determination of reliability of iso and interconnected generation systems.

**UNIT III TRANSMISSION SYSTEM RELIABILITY ANALYSIS** **9**

Deterministic contingency analysis-probabilistic load flow-Fuzzy

load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served.

**UNIT IV EXPANSION PLANNING 9**

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

**UNIT V DISTRIBUTION SYSTEM PLANNING OVERVIEW 9**

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1.Roy Billinton and Allan Ronald, "Power System Reliability."

2.J.Endreny,"Reliability modeling in electric power systems"John Wiley & sons

**REFERENCES**

1. Proceeding of work shop on energy systems planning & manufacturing CI.

2. R.L .Sullivan, " Power System Planning",.

3. Turan Gonen, Electric power distribution system Engineering 'McGraw Hill,1986



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## POWER SYSTEM TRANSIENTS

**AIM**

To review the over voltages (or) surges due to the phenomena of switching operations and lighting discharge. Also to study propagation, reflection and refraction of these surges on the equipments their impact on the power system grid.

**OBJECTIVES**

(i)To study the generation of switching transients and their control using circuit - theoretical concept.

(ii)To study the mechanism of lighting strokes and the production of lighting surges.

(iii)To study the propagation, reflection and refraction of travelling waves.

(iv)To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

(v)To study the over voltages faults and switching surges on integrated system.

**UNIT I INTRODUCTION AND SURVEY 9**

Review and importance of the study of transients - causes for transients. RL circuit transient with sine wave excitation - double frequency transients - basic transforms of the RLC circuit transients. Different types of power system transients - effect of transients on power systems - role of the study of transients in system planning.

**UNIT II SWITCHING TRANSIENTS 9**

Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch - normal and abnormal switching transients. Current suppression - current chopping - effective

equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients - ferro resonance.

**UNIT III LIGHTNING TRANSIENTS 9**

Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds - mechanism of lightning discharges and characteristics of lightning strokes - model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

**UNIT IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS 9**

Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely's lattice diagram - standing waves and natural frequencies - reflection and refraction of travelling waves.

**UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM 9**

The short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults - switching surges on integrated system. Qualitative application of EMTP for transient computation.

**TOTAL HOURS : 45**

**TEXT BOOKS**

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Interscience, New York, 2nd edition 1991.

2. R.D.Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

**REFERENCE BOOKS**

1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 2nd edition, 2000.



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**PRINCIPLES OF COMMUNICATION ENGINEERING**

**AIM:**

To understand the principles of communication engineering.

**OBJECTIVES:**

- To understand the basic terms in communication systems
- To understand the concept and implementation of amplitude modulation
- To understand the concept and implementation of angle modulation
- To understand basics of information theory and pulse modulation types
- To understand the concepts of digital and broadband communications.

**1. INTRODUCTION OF COMMUNICATIONS SYSTEMS: 9**

Communications systems, Modulation, Bandwidth requirements, Noise- External Noise, Internal Noise, Noise calculations, Noise figure, Noise temperature.

**2. AMPLITUDE MODULATION: 9**

Amplitude modulation theory, Generation of AM, Single- sideband techniques- Evolution and description of SSB, Suppression of carrier, Suppression of Unwanted sidebands, Extension of SSB, Radio receivers - AM receivers, Single and independent Sideband receivers.

**3. ANGLE MODULATION: 9**

Frequency Modulation - Theory of Frequency Modulation and Phase Modulation, Noise, Generation of Frequency Modulation, Radio receivers- FM receivers.

**4. PULSE COMMUNICATIONS: 9**

Information theory, Pulse modulation types -PWM, PPM and PCM, Pulse systems.

**5. DIGITAL & BROADBAND COMMINICATIONS SYSTEMS: 9**

Digital technology, Fundamentals of data communications systems, Data sets and Interconnection requirements, Network and control considerations, Broadband - Multiplexing, Short and Medium haul systems, Long haul systems, Elements of Long distance telephony.

**TOTAL HOURS: 45**

**TEXT BOOKS:**

1. George Kennedy and Bernard Davis, "Electronic communication systems", Tata McGraw - Hill Publication, 1999.

**REFERENCES:**

1. B.P.Lathi, "Analog and Digital Communication systems", PHI, 1992.

2. Proakis, "Digital Communications", Tata McGraw - Hill Publication, 1999.

3. A.B.Carlson, "Communication Systems", Tata McGraw - Hill Publication, 1992.



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## ROBOTICS AND AUTOMATION

**(Common to ECE, MECHAT, EEE & CSE)**

**AIM**

To learn the fundamentals of Robotics and implementation aspects of real time concepts.

**OBJECTIVES**

- To learn about the Basic concepts of Robots
- To study the Sensor and Vision Systems.
- To learn the Grippers and robot dynamics.
- To know about kinematics and path planning.
- To learn about Robot Programming Languages and applications

**UNIT I BASIC CONCEPTS 9**

Origin & various generation of Robots - Robot definition - Robotics system components - Robot classification - Coordinate frames - Asimov's laws of robotics - degree of freedom - work volume - Need for Automation - types of automation - fixed, programmable and flexible automation.

**UNIT II SENSORS AND VISION SYSTEM 9**

Sensing - Range, proximity, position, velocity, acceleration, Touch, Force, Torque, Optical & laser sensors.Machine vision - Introduction, Image acquisition, Illumination Techniques, Image conversion, Cameras, Image processing and analysis - image data reduction - segmentation feature extraction - Object recognition.

**UNIT III GRIPPERS AND ROBOT DYNAMICS 9**

Introduction - various types of grippers-design considerations. Construction of Manipulator - Introduction to Robot - Dynamics - Lagrange formulation - Newton Euler formulation - Properties of robot dynamic equations.

**UNIT IV KINEMATICS AND PATH PLANNING 9**

Forward Kinematics - Denavit Hartenberg Representation. Inverse Kinematics - Geometric approach.

**UNIT V PROGRAMMING LANGUAGES AND APPLICATIONS 9**

Robot programming - Fixed instruction, sequence control, General programming language, Specific programming languages. Robots for welding, painting and assembly - Remote Controlled robots - Robots for nuclear, thermal and chemical plants.

**Total Hours: 45**

**TEXT BOOKS:**

1. Mikell P. Groover ,Weiss G.M. Nagel R.N. Odraj . N.G. , "Industrial Robotics", Tata Mc Graw Hill, 3rd Reprint, Edition 2008.

2. Deb.S.R. "Robotics Technology and flexible Automation", Tata Mc Graw Hill, 9th Reprint 2004.

3. K.S Fu, R C.Gonzalez, CSG Lee- "Robotics", McGraw Hill, Edition 2008.

**REFERENCE BOOKS:**

1. John J Craig "Introduction to Robotics Mechanics & control, Low price Edition, 7th Reprint, 2005.

2. Ghosh, "Control in Robotics and Automation : Sensor Based Integration", Allied Publishers.



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## SPECIAL ELECTRICAL MACHINES

**OBJECTIVES:**

(i) Provide the concept of construction, operating principle and characteristics of synchronous reluctance motor, stepper motor and switched reluctance motor..

(ii) Give basic knowledge about the principle of operation, analysis, emf and torque equation, and control of permanent magnet synchronous motors and brushless DC motors

**UNIT I SYNCHRONOUS RELUCTANCE MOTORS 9**

Constructional features - Types - Axial and Radial flux motors - Operating principles - Variable Reluctance and Hybrid Motors - SYNREL Motors - Voltage and Torque Equations - Phasor diagram - Characteristics.

**UNIT II STEPPING MOTORS 9**

Constructional features - Principle of operation - Variable reluctance motor - Hybrid motor - Single and multi stack configurations - Torque equations - Modes of excitations - Characteristics - Drive circuits - Microprocessor control of stepping motors - Closed loop control.

**UNIT III SWITCHED RELUCTANCE MOTORS 9**

Constructional features - Rotary and Linear SRMs - Principle of operation - Torque production - Steady state performance prediction- Analytical method -Power Converters and their controllers - Methods of Rotor position sensing - Sensorless operation - Closed loop control of SRM - Characteristics.

**UNIT IV PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9**

Permanent Magnet materials - Magnetic Characteristics - Permeance coefficient - Principle of operation - Types - Magnetic cir-

cuit analysis - EMF and torque equations - Commutation - Power controllers - Motor characteristics and control.

**UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS 9**

Principle of operation - Ideal PMSM - EMF and Torque equations - Armature reaction MMF - Synchronous Reactance - Sinewave motor with practical windings - Phasor diagram Torque/ speed characteristics - Power controllers - Converter Volt-ampere requirements.

**TOTAL HOURS: 45**

**TEXT BOOKS**

1. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.

2. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

**REFERENCE BOOKS**

1. R.Krishnan, 'Switched Reluctance Motor Drives - Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.

2. P.P. Aearnley, 'Stepping Motors - A Guide to Motor Theory and Practice', Peter Perengrinus, London, 1982.

3. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.



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## VLSI DESIGN TECHNIQUES

**(COMMON TO ECE, EEE, BME, EIE & MECHAT)**

**AIM:**

To learn about the VLSI technology

**OBJECTIVES:**

- To study the MOS transistor and technology
- To study the stick diagram characteristics
- To study the circuit characterization
- To study the VLSI components
- To study the Verilog language

**UNIT I MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY 9**

NMOS and PMOS transistors - Threshold voltage - Body effect - Design equations - Second order effects - MOS models and small signal AC characteristics - Basic CMOS technology.

**UNIT II INVERTERS AND LOGIC GATES 9**

NMOS and CMOS Inverters - Stick diagram - Inverter ratio - DC and transient characteristics -switching times - Super buffers - Driving large capacitance loads - CMOS logic structures -Transmission gates - Static CMOS design - Dynamic CMOS design.

**UNIT III CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION 9**

Resistance estimation - Capacitance estimation - Inductance - Switching characteristics -Transistorsizing - Power dissipation and design margining - Charge sharing - Scaling.

**UNIT IV CMPONENTS AND SYSTEM LEVEL PHYSICAL DESIGN** **9**

Multiplexers - Decoders - comparators - Priority encoders - Shift registers - Arithmetic circuits -Ripple carry adders - Carry look ahead adders - High-speed adders - Multipliers- Physical design -Delay modeling - Cross talk - Floor planning - Power distribution - Clock distribution - Basics of CMOS testing.

**UNIT V VERILOG HARDWARE DESCRIPTION LANGUAGE** **9**

Overview of digital design with Verilog HDL - Hierarchical modeling concepts - Modules and port definitions - Gate level modeling - Data flow modeling - Behavioral modeling - Task & functions -Test Bench.

**TOTAL HOURS: 45**

**TEXT BOOKS:**

1. Neil H.E. Weste, Kamran Eshraghian, "Principles of CMOS VLSI Design", Pearson Education ASIA, 2nd edition, 2000.

2. Samir Palnitkar, "Verilog HDL", Pearson Education, 2nd Edition, 2004.

**REFERENCES:**

1. Pucknell, "Basic VLSI Design", Prentice Hall of India Publication, 1995.

2. Eugene D. Fabricius, "Introduction to VLSI Design", McGraw Hill International Editions,1990.

3. Bhasker J., "A Verilog HDL Primer", 2nd Edition, B.S. Publications, 2001.

4. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley & Sons, Inc.,2002.



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## WIND ENERGY CONVERSION SYSTEMS
## (COMMON TO EEE & EIE)

**OBJECTIVE:**

(i)To learn the types of renewable energy sources

(ii)To study the application of electrical machines in renewable energy conversion

(iii)To study the application of semi conductor devices in renewable energy conversion

(iv)To analyze the grid integrated renewable energy.

(v)To introduce the hybrid renewable energy systems

**UNIT I INTRODUCTION** **9**

Components of WECS-WECS schemes-Power obtained from wind-simple momentum theory-Power coefficient-Sabinin's theory-Aerodynamics of Wind turbine

**UNIT II WIND TURBINES** **9**

HAWT-VAWT-Power developed-Thrust-Efficiency-Rotor selection-Rotor design considerations-Tip speed ratio-No. of Blades-Blade profile-Power Regulation-yaw control-Pitch angle control-stall control-Schemes for maximum power extraction.

**UNIT III FIXED SPEED SYSTEMS** **9**

Generating Systems- Constant speed constant frequency systems -Choice of Generators-Deciding factors-Synchronous Generator-Squirrel Cage Induction Generator- Model of Wind Speed-Model wind turbine rotor - Drive Train model-Generator model for Steady state and Transient stability analysis.

**UNIT IVVARIABLE SPEED SYSTEMS** **9**

Need of variable speed systems-Power-wind speed characteristics-Variable speed constant frequency systems synchronous

generator- DFIG- PMSG -Variable speed generators modeling - Variable speed variable frequency schemes.

**UNIT V GRID CONNECTED SYSTEMS 9**

Stand alone and Grid Connected WECS system-Grid connection Issues-Machine side & Grid side controllers-WECS in various countries

**TOTAL HOURS : 45**

**REFERENCE BOOKS**


1. L.L.Freris "Wind Energy conversion Systems", Prentice Hall, 1990

2. Ion Boldea, "Variable speed generators", Taylor & Francis group, 2006.

3. E.W.Golding "The generation of Electricity by wind power", Redwood burn Ltd., Trowbridge,1976.

4. S.Heir "Grid Integration of WECS", Wiley 1998.




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**INDUSTRIAL ELECTIVES**

**LEARNING IT ESSENTIALS BY DOING**

**Unit I:**

- Fundamentals of Computer architecture-introduction-organization of a small computer
- Central Processing Unit - Execution cycle - Instruction categories - measure of CPU performance Memory - Input/output devices - BUS-addressing modes.
- System Software - Assemblers - Loaders and linkers - Compilers and interpreters
- Operating system - introduction - memory management schemes Process management Scheduling - threads.

**Unit II:**

- Problem solving with algorithms- Programming styles -
- Coding Standards and Best practices - Introduction to C Programming
- Testing and Debugging. Code reviews
- System Development Methodologies - Software development Models
- User interface Design - introduction - The process - Elements of UI design & reports.

**Unit III:**

- RDBMS- data processing - the database technology - data models
- ER modeling concept -notations - Extended ER features
- Logical database design - normalization
- SQL - DDL statements - DML statements - DCL statements

♦ Writing Simple queries - SQL Tuning techniques - Embedded SQL - OLTP

**Unit IV:**

♦ Objected oriented concepts - object oriented programming

♦ UML Class Diagrams- relationship - Inheritance - Abstract classes - polymorphism

♦ Object Oriented Design methodology - Common Base class

♦ Alice Tool - Application of OOC using Alice tool.

**Unit V:**

♦ Client server computing - Internetworking - Computer Networks -

♦ Working with TCP/IP - IP address - Sub netting - DNS - VPN - proxy servers World Wide Web - Components of web application - browsers and Web Servers

♦ URL - HTML - HTTP protocol - Web Applications - Application servers - Web Security.



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## BUSINESS INTELLIGENCE AND ITS APPLICATIONS

**UNIT - I INTRODUCTION TO BUSINESS INTELLIGENCE 9**

Introduction to OLTP AND OLAP - BI Definition and BI Concepts - Business Applications of BI - BI Framework- Role of Data Warehousing in BI -BI Infrastructure Components- BI Process - Developing Data Warehouse - Management Framework - Business driven approach -BI Technology -- BI Roles & Responsibilities

**UNIT - II BASICS OF DATA INTEGRATION (Extraction Transformation Loading) 9**

Concepts of Data Integration need and advantages of using Data Integration - Introduction to common data integration approaches - Introduction to ETL using SSIS - Introduction to Data Quality - Data Profiling Concepts and Applications.

**UNIT - III INTRODUCTION TO MULTIDIMENSIONAL DATA MODELING 9**

Introduction to Data and Dimensional Modeling - Multi Dimensional Data Model - ER modeling Vs Multi Dimensional Model - Concepts of Dimensions - facts - cubes- attributes- hierarchies- star and snowflake schema - Introduction to Business Metrics and KPIs - Creating Cubes using SSAS.

**UNIT - IV BASICS OF ENTERPRISE REPORTING 9**

Introduction to Enterprise Reporting - Concepts of dashboards - balanced scorecards - Introduction to SSRS Architecture- Enterprise Reporting using SSRS reporting service

**UNIT - V BI ROAD AHEAD 9**

BI and Mobility - BI and cloud computing - BI for ERP systems - Benefits of BI in ERP-NorthWind_Traders Data-Data Analyses through Excel-Kettle Tool - Conversion of data using Kettle Tool.

**TOTAL : 45**

**TEXT BOOKS**

RN Prasad, Seema Acharya, "Fundamentals Of Business Analytics" Wiley India,2011

**REFERENCE BOOKS**

1. Soumendra Mohanty, "Data Warehousing Design, Development and Best Practices", Tata McGraw-Hill, New Delhi, 2007

2. David Loshin, "Business Intelligence", Morgan Kaufmann Publishsers, San Francisco, Fifth edition, 2007

3. Larissa Terpeluk Moss and Shaku Atre, "Business Intelligence Roadmap", Pearson Education, 2007



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## VIRTUAL INSTRUMENTATION

**AIM**

To provide comprehensive knowledge in virtual instrumentation and some of its applications.

**OBJECTIVE**

- Review background information required for studying virtual instrumentation.
- Study the basic building blocks of DAQ in virtual instrumentation.
- Study the various techniques of interfacing of external instruments of PC.
- Study the various graphical programming environments in virtual instrumentation
- Study a few applications in virtual instrumentation

**UNIT I - REVIEW OF DIGITAL INSTRUMENTATION 6**

Representation of analog signals in the digital domain - Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

**UNIT II FUNDAMENTALS OF VIRTUAL INSTRUMENTATION 10**

Concept of virtual instrumentation - PC based data acquisition - Typical on board DAQ card - Resolution and sampling frequency - Multiplexing of analog inputs - Single-ended and differential inputs - Different strategies for sampling of multi-channel analog inputs. Concept of universal DAQ card - Use of timer-counter and analog outputs on the universal DAQ card.

**UNIT III CLUSTER OF INSTRUMENTS IN VI SYSTEM 10**

Interfacing of external instruments to a PC - RS232, RS 422, RS 485

and USB standards - IEEE 488 standard - ISO-OSI model for serial bus - Introduction to bus protocols of MOD bus and CAN bus.

**UNIT IV GRAPHICAL PROGRAMMING ENVIRONMENT IN VI 10**

Concepts of graphical programming - Lab-view software - Concept of VIs and sub VI - Display types - Digital - Analog - Chart - Oscilloscopic types - Loops - Case and sequence structures - Types of data - Arrays - Formulae nodes -Local and global variables - String and file I/O.

**UNIT V ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI 9**

Fourier transform - Power spectrum - Correlation - Windowing and filtering tools - Simple temperature indicator - ON/OFF controller - P-I-D controller - CRO emulation - Simulation of a simple second order system - Generation of HTML page.

**L = 45 Total = 45**

**TEXT BOOKS**


1. S. Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument society of America, 1994.
2. Peter W. Gofton, 'Understanding Serial Communications', Sybex International.
3. Robert H. Bishop, 'Learning with Lab-view', Prentice Hall, 2003.


**REFERENCE BOOKS**


1. Kevin James, 'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control', Newness, 2000.
2. Gary W. Johnson, Richard Jennings, 'Lab-view Graphical Programming', McGraw Hill Professional Publishing, 2001.