**COURSE STRUCTURE**
**AND**
**DETAILED SYLLABUS**

**II, III & IV – B.TECH – I & II SEMESTERS**

# ELECTRICAL AND ELECTRONICS ENGINEERING

**FOR**
**B.TECH FOUR YEAR DEGREE COURSE**
**(Applicable for the batches admitted from 2015-2016)**

**ANURAG GROUP OF INSTITUTIONS**
**(AUTONOMOUS)**
**Venkatapur, Ghatkesar, Hyderabad – 500 088, Telangana State.**

**B.Tech EEE II Year I Semester** **COURSE STRUCTURE**

| Subject Code | Classification | Subject | Lectures | T/P/D | Credits |
|---|---|---|---|---|---|
| A53008 | BS | Mathematics-IV | 4 | 1 | 4 |
| A53009 | ES | Switching Theory and Logic Design | 3 | 1 | 3 |
| A53010 | ES | Electronic Devices & Circuits | 3 | 1 | 3 |
| A53011 | PC | Network Theory | 3 | 1 | 3 |
| A53012 | PC | Electro Magnetic Fields | 3 | 1 | 3 |
| A53013 | PC | Electrical machines -I | 4 | 1 | 4 |
| A53007 | MC | Gender sensitization | 2 | 0 | 0 |
| A53203 | PC | Computer Aided Electrical Drawing Lab | - | 3 | 2 |
| A53204 | ES | Electrical Circuits Lab | - | 3 | 2 |
| Total | | | 22 | 12 | 24 |

**B.Tech EEE II Year II Semester** **COURSE STRUCTURE**

| Subject Code | Classification | Subject | Lectures | T/P/D | Credits |
|---|---|---|---|---|---|
| A54007 | ES | Electronic Circuits | 3 | 1 | 3 |
| A54008 | HS | Managerial Economics & Financial Analysis | 3 | 1 | 3 |
| A54009 | PC | Power systems –I | 3 | 1 | 3 |
| A54010 | PC | Control systems | 4 | 1 | 4 |
| A54006 | BS | Environmental Studies | 3 | 1 | 3 |
| A54011 | PC | Electrical machines –II | 4 | 1 | 4 |
| A54012 | MC | NSO / NSS | 2 | 0 | 0 |
| A54204 | PC | Electrical machines Lab –I | - | 3 | 2 |
| A54205 | ES | Electronic Devices and Circuits lab | - | 3 | 2 |
| **Total** | | | **22** | **12** | **24** |

**B.Tech EEE III Year I Semester** **COURSE STRUCTURE**

| Subject Code | Classification | Subject | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A55012 | PC | Electrical Measurements | 3 | 1 | 3 |
| A55013<br>A55014<br>A55015 | Professional Elective - 1 | 1.Optimization Techniques<br>2.Renewable Energy Sources<br>3.Linear System Analysis | 3 | 1 | 3 |
| A55016 | PC | Power Electronics | 3 | 1 | 3 |
| A55017 | PC | Power Systems –II | 3 | 1 | 3 |
| A55018 | PC | Electrical machines –III | 4 | 1 | 4 |
| A55019<br>A55020<br>A55021 | Professional Elective - 2 | 1. Signals and Systems<br>2. Neural Networks and Fuzzy Logic<br>3. Fluid Mechanics and Hydraulic Machinery | 4 | 1 | 4 |
| A55022 | MC | English for life skills | 2 | 0 | 0 |
| A55203 | PC | Control Systems Lab | - | 3 | 2 |
| A55204 | PC | Electrical machines Lab -II | - | 3 | 2 |
| **Total** | | | **22** | **12** | **24** |

**B.Tech EEE III Year II Semester** **COURSE STRUCTURE**

| Subject Code | Classification | Subject | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A56012 | PC | Switch Gear and Protection | 4 | 1 | 4 |
| A56013 | PC | Power System Operation and Control | 3 | 1 | 3 |
| A56014 | PC | Micro Processors & Micro Controllers | 4 | 1 | 4 |
| A56015 | PC | Instrumentation | 3 | 1 | 3 |
| A56016<br>A56017<br>A56018 | Professional Elective - 3 | 1. IC Applications<br>2. Principles of Computer Networks<br>3.Materials in Electrical systems | 3 | 1 | 3 |
| A56019<br>A56020<br>A56021 | Professional Elective - 4 | 1. High Voltage Engineering<br>2. Digital Signal Processing<br>3. Computer Architecture | 3 | 1 | 3 |
| A56011 | MC | Logical Reasoning and Quantitative Aptitude | 2 | 0 | 0 |
| A56203 | PC | Power Electronics Lab | - | 3 | 2 |
| A56204 | HS | Advanced English Communication Skills lab | - | 3 | 2 |
| **Total** | | | **22** | **12** | **24** |

**B.Tech EEE IV Year I Semester** **COURSE STRUCTURE**

| Subject Code | Classification | Subject | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A57013 | PC | Utilization of Electrical Energy | 3 | 1 | 3 |
| A57014 | PC | Computer Methods in Power Systems | 3 | 1 | 3 |
| A57015 | PC | Power Semi Conductor Drives | 3 | 1 | 3 |
| A57016<br>A57017<br>A57018 | Professional Elective - 5 | 1.HVDC Transmission<br>2.Flexible AC Transmission Systems<br>3.Advanced Power Electronics | 3 | 1 | 3 |
| A57019<br>A57020<br>A57021 | Professional Elective - 6 | 1. EHV AC Transmission<br>2. Electrical Distribution Systems<br>3. Power System Reliability | 3 | 1 | 3 |
| A57022<br>A57023<br><br>A57024 | Open Elective -1 | 1.VLSI System Design<br>2.Principles of Data Base Management Systems<br>3.Digital Communication | 3 | 1 | 3 |
| A57204 | PC | Micro Processors & Micro Controllers lab | - | 3 | 2 |
| A57205 | PC | Electrical Measurements Lab | - | 3 | 2 |
| A57206 | PW | Industry Oriented Mini Project | - | - | 2 |
| **Total** | | | 18 | **15** | **24** |

**B.Tech EEE IV Year II Semester** **COURSE STRUCTURE**

| Subject Code | Classification | Subject | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A58007<br>A58008<br>A58009 | Open Elective -2 | 1. Management Science<br>2. Disaster Management<br>3. Project Management | 3 | 1 | 3 |
| A58010<br><br>A58002<br>A58011 | Open Elective -3 | 1. Object Oriented Programming and Java<br>2. Intellectual Property Rights<br>3. Nano Technology | 3 | 1 | 3 |
| A58204 | PW | Technical Seminar | - | 6 | 3 |
| A58205 | PW | Comprehensive Viva- Voce | - | - | 3 |
| A58206 | PW | Project Work | - | 15 | 12 |
| **Total** | | | **6** | **23** | **24** |

Note: All End Examinations (Theory and Practical) are of three hours duration.

**T – Tutorial** **P – Practical** **D – Drawing**

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**B.Tech EEE II Year I-Semester**

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## (A53008) MATHEMATICS-IV

**Prerequisite: Nil**

**Course Objectives:**

1. Analyze the characteristics and properties of Fourier transforms
2. To introduce the basic theory of functions of a complex variable and complex analysis methods.
3. To find the limits of functions and determine continuity of functions and use power series and line integrals to construct differentiable functions.
4. To find Laurent series about isolated singularities and determine residues and use the residue theorem to compute several kinds of real integrals.
5. To use conformal mapping to solve the Dirichlet problem in region.

### UNIT-I: FOURIER TRANSFORMATIONS

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transforms - Fourier sine and cosine transforms – properties –inverse transforms – Convolution theorem – Finite Fourier transforms.

### UNIT-II: FUNCTIONS OF A COMPLEX VARIABLE

Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method. Elementary functions: Exponential, trigonometric, hyperbolic functions and their properties – General power Z (c is complex), principal value.

### UNIT-III: COMPLEX INTEGRATION AND COMPLEX POWER SERIES

Line integral – evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity.

### UNIT-IV: CONTOUR INTEGRATION

Residue – Evaluation of residue by formula and by Laurent series - Residue theorem.
Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{C}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

(c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ (d) Integrals by indentation.

**UNIT-V: CONFORMAL MAPPING**

Transformation by $e^Z, \ln Z, Z^2, Z^n$ (n positive integer), Sin z, cos z, z + a/z. Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles and cross ratio – determination of bilinear transformation mapping 3 given points .

**TEXT BOOKS :**


1. A text Book of Engineering Mathematics, Vol-III - *T. K. V. Iyengar, B. Krishna Gandhi and Others,* S. Chand & Company.
2. Higher Engineering Mathematics - *Grewal B.S (2007)* - 40th Edition, New Delhi, Khanna Publishers.
3. Mathematical Methods - *Iyengar T.K.V., Krishna Gandhi B. & Others (2011)* - 10th Revised Edition, New Delhi, S. Chand & Company Limited.
4. A text Book of Engineering Mathematics - *C. Sankaraiah,* V. G. S. Book Links.
5. A text Book of Engineering Mathematics - *P. Nageshwara Rao, Y. Narasimhulu & N. Prabhakar Rao,* Deepthi Publications.


**REFERENCE BOOKS:**


1. A text Book of Engineering Mathematics - *B. V. Raman*, Tata Mc Graw Hill.
2. Advanced Engineering Mathematics - *Irvin Kreyszig*, Wiley India Pvt. Ltd.
3. A text Book of Engineering Mathematics - *Thamson Book Collection.*
4. Engineering Mathematics- III - *Shahanaz Bathul (2010),* 2nd Edition, Hyderabad, PHI Learning Private Limited.
5. *Schaum's outline* series on Complex Anlysis.
6. Mathematical Methods of Science and Engineering (Aided with Matlab) - *Kanti B.Datta (2012),* Seventh Edition, CENGAGE Learning.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to:

1. Determine Fourier transform, Fourier sine and cosine transform of a function
2. Apply complex analysis in the study of mechanics of solids and liquids, thermodynamics, electrical fields etc
3. Apply Taylor's and Laurent series in evaluation of both real and complex integrals in summation of series.
4. Apply Residue theorem which is an elegant theorem in complex integration and useful in evaluating complicated real integrals.
5. Apply conformal mapping in solving boundary value problems in two dimensional potential theories by transforming a complicated region to simpler region as it preserves solutions of two dimensional Laplace equations.
6. Develop alternative ways to solve a problem and systematic approach of a solution for a real time applications.

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| **B.Tech EEE II Year I-Semester** | **L** | **T** | **C** |
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### (A53009) SWITCHING THEORY AND LOGIC DESIGN

**Prerequisite: - None**

**Course Objectives:**
The main objectives are

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

**UNIT-I: NUMBER SYSTEMS AND CODES**
Review of number systems binary arithmetic, binary weighted and non-weighted codes. Error detecting and error correcting codes.

**BOOLEAN ALGEBRA**
Postulates and theorems: representation of switching functions, SOP and POS forms Karnaugh Map representations, minimization using K Maps.

**UNIT- II: DESIGN OF COMBINATIONAL CIRCUITS**
Tabular minimization – design of single output and multi output functions design using conventional AND, OR, NOT, NAND, NOR & EX-OR gates. Design using MSI & LSI devices, digital multiplexer/selector, decode demultiplexer, design of 4 bit adder, carry look-ahead adder, magnitude comparator, BCD converter. Logic implementations using ROM, PAL & PLA.

**UNIT-III: INTRODUCTION TO SEQUENTIAL CIRCUITS**
Combinational versus sequential circuits, asynchronous versus synchronous circuits, state table and state diagram, state assignment, memory elements and their excitation functions, T flip flop, RS flip flop, JK flip flop and their excitation requirements. Design of synchronous sequential circuits like sequence detectors and binary counters.

**UNIT-IV: CAPABILITIES AND MINIMIZATION OF SEQUENTIAL MACHINES**
Melay and Moore machines, capabilities and limitations of finite state machine, state equivalence and machine minimization.

**UNIT-V: ALGORITHIMIC STATE MACHINES**
ASM chart, timing considerations, control implementation, design with multiplexers and PLA control. Introduction to unate functions and threshold logic.

**TEXT BOOKS:**

1. Switching and Finite Automata Theory – *Zvi Kohavi*, TMH Edition.
2. Digital Logic Computer Design – *M. Morris Mano*, PHI.
3. Digital Logic Design Principles – *Norman Balbamian and Breadly*, John Wiley

**REFERENCE BOOKS:**

1. Introduction to Switching Theory and Logic Design- *F. J. Hill and Peterson*, John Wiley Publications.
2. Digital Logic – Applications & Design – *John M. Yarbroough*, Vikas Publications, 1997.
3. Digital System Design – *R. P. Jain*, TMH.
4. Digital Systems Principles, Applications– *Ronald J. Tocci*, Pearson Education/Phil

**Course Outcomes:**

Upon completion of the course, students should possess the following skills:

1. Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
2. Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

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**B.Tech EEE II Year I-Semester**

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## (A53010) ELECTRONIC DEVICES AND CIRCUITS

**Course Objectives:**

1. To explain the operation of PN diode etc and how to design regulated power supply.
2. To provide an overview of the principles, operation and application of the analog devices like BJT,FET etc
3. To understand various biasing techniques to stabilize transistor operating point
4. To explain the operation, design and analysis of small signal amplifiers using BJT & FET.
5. To analyze different feedback techniques and the design of oscillators for getting sustained oscillations.

### UNIT I : P-N JUNCTION DIODE AND RECTIFIERS

Quantative theory of P-N Junction, P-N Junction as Diode, Diode Equation, Volt-Ampere Characteristics, Temperature Dependence of VI Characteristic, Transition and Diffusion Capacitances, Diode Equivalent Circuits, Breakdown Mechanisms in Semi Conductor Diodes, Zener Diode Characteristics, Principle of Operation and Characteristics of Tunnel Diode, Schottky Barrier Diode.

The P-N Junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic Components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L-Section Filters, Π-Section Filters, Comparison of Filters, Voltage Regulation Using Zener Diode, SCR.

### UNIT II: BIPOLAR JUNCTION TRANSISTOR AND FIELD EFFECT TRANSISTOR

The Junction Transistor, Transistor Current Components, Transistor Construction, BJT Operation, BJT Symbol, Transistor as an Amplifier, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation, BJT Specifications.

The Junction Field Effect Transistor (Construction, Principle of Operation, Symbol), Pinch –Off Voltage –Volt –Ampere Characteristics, The JFET Small Signal Model, MOSFET (Construction, Principle of Operation, Symbol) MOSFET Characteristics In Enhancement and Depletion Modes.

### UNIT III: TRANSISTOR BIASING AND STABILIZATION

Operating Point, The DC and AC Load Lines, Need For Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization Against Variation In $V_{BE}$ and β, Bias Compensation Using Diodes and Transistors. Thermal Runway, Thermal Stability, Biasing FET.

**UNIT IV: BJT AND FET AMPLIFIERS**

BJT Hybrid Model, Determination of h-Parameters From Transistor Characteristics, Analysis of A Transistor Amplifier Circuit Using h-Parameters, Comparison of CB, CE And CC Amplifier Configurations.FET Common Source Amplifier, Common Drain Amplifier, Generalized FET Amplifier, FET, As Voltage Variable Resistor, Comparison of BJT And FET, The Uni Junction Transistor

**UNIT – V: FEED BACK AMPLIFIERS AND OSCILLATORS**

Concepts of feedback. Claffication of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Simple problems.

**OSCILLATORS:** Condition for oscillations. RC and LC type oscillators, Crystal oscillators, Frequency and amplitude stability of oscillators, Generalized analysis of LC oscillators, Quartz (Hartley, Colpitts), RC-phase shift and Wien-bridge oscillators.

**TEXT BOOKS:**


1. Millman's Electronic Devices and Circuits – *J. Millman, C.C.Halkias, and Satyabrata Jit* , Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – *R.L. Boylestad and Louis Nashelsky*, Pearson/Prentice Hall,9th Edition,2006.
3. Introduction to Electronic Devices and Circuits- *Rober T. Paynter* , PE.
4. Electronics Devices and Circuits – *A. P. Godse* , Technical Publications.


**REFERENCE BOOKS:**


1. Electronic Devices and Circuits – *T.F. Bogart Jr., J.S.Beasley and G.Rico*, Pearson Education, 6th edition, 2004.
2. Principles of Electronic Circuits – *S.G.Burns and P.R.Bond, Galgotia Publications*, 2nd Edn.., 1998.
3. Microelectronics – *Millman and Grabel*, Tata McGraw Hill, 1988.
4. Electronic Devices and Circuits – *Dr. K. Lal Kishore*, B.S.


**Course Outcomes:** After completing this course students must have the ability to

1. Understand characteristics of semiconductor devices, diodes, bi polar junction transistors
2. Introduce to the revolutionary Field Effect Transistors that lead to the development of integrated circuits and study their construction and characteristics.
3. Design simple basic electronic circuits like rectifiers, voltage regulators, amplifiers & oscillators using both BJTs and FETs.
4. Practically design and realize rectifier and amplifier circuits in the lab. Introduction to linked course.

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**B.Tech EEE II Year I-Semester**

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## (A53011) NETWORK THEORY

**Prerequisite: - Electrical Circuits**

**Course Objectives:**

1. To understand Three phase circuits.
2. To analysis transients in Electrical systems.
3. To perform Synthesis on given Electrical Network from a given impedance/ admittance function
4. To evaluate Network parameters of given Electrical network and design of filters.

### UNIT –I: NETWORK TOPOLOGY

Definitions - Graph - Tree, Basic cut-set and Basic Tie-set matrices for planar networks - Duality & Dual networks.

### THREE PHASE CIRCUITS

Phase sequence- Star and delta connection-Relation between line and phase voltages and currents in balanced systems- Analysis of balanced and unbalanced three phase circuits-Measurement of active and reactive power.

### UNIT-II: D.C AND A.C TRANSIENT ANALYSIS

Transient response of R-L, R-C, R-L-C circuits (series and parallel) for D.C excitation- Initial conditions- Solution method using differential equation and Laplace transforms .

Transient response of R-L, R-C, R-L-C circuits (series only) for sinusoidal excitation- Initial conditions- Solution method using differential equation and Laplace transforms .

### UNIT-III: NETWORK FUNCTIONS

The concept of complex frequency, Physical interpretation of complex frequency, Transform impedance and Transform circuits, Series and Parallel combination of elements, Terminal pairs or ports, Network functions for the one port and two port, poles and zeros of network functions, Significance of poles and zeros, Properties of driving point functions, Properties of transfer functions, Necessary conditions for driving point function, Necessary conditions for transfer functions, Time domain response from pole zero plot.

### UNIT-IV: NETWORK PARAMETERS

Two port network parameters- Z, Y, A, B, C, D and Hybrid parameters and their relations.

Cascaded networks, Concept of transformed network- Two port network parameters using transformed variables.

**UNIT-V: FILTERS**

Low pass, High pass, Band pass, Band Elimination, Prototype filter design.

**TEXT BOOKS:**

1. Electric circuits - *A.Chakrabarthy*, Dhanpat Rai & Sons,2006.
2. Circuits & Networks - *A.Sudhakar and Shyammohan S.Palli*, Tata McGraw-Hill, 2012.

**REFERENCE BOOKS:**

1. Electric Circuit analysis-Hayt And Kimberley
2. Network analysis - *Mahmood Nahvi, Joseph Edminister*, Schaum's Outlines, 4th edition, McGraw-Hill Companies,Incorporated, 2003.
3. Network Analysis - *M.E Van Valkenberg.* Prentice-Hall, 1974.
4. Basic circuits analysis - *D.R Cunningham. & J.A. Stuller*, Jaico Publications, 1993.
5. Electric Circuit analysis - *B.Subrahmanyam*, I.K International

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Describe The importance of three phase circuit for balanced and unbalanced conditions
2. Analyze the transient behavior of electrical networks in time domain and frequency domain.
3. Illustrate the concept of complex frequency, transform impedance, significance of poles and zeros of a given transfer function and network synthesis.
4. Ability to Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and Solve the circuits.

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**B.Tech EEE II Year I-Semester**

| L | T | C |
|---|---|---|
| 3 | 1 | 3 |

## (A53012) ELECTRO MAGNETIC FIELDS

**Prerequisite: - Mathematics, Physics**

**Course Objectives:**

1. To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.
2. Understand the behavior of magnetic and electric fields in the presence of dielectric and magnetic materials, determine how to simply modify expressions for capacitance and inductance from free space expressions.
3. Define and derive expressions for the energy both for the electrostatic and magnetostatic fields, and derive Poyntings theorem from Maxwells equations
4. Evaluate Maxwells Equations for time-harmonic fields and the boundary conditions across media boundaries.

### UNIT – I: ELECTROSTATICS

Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems – Divergence theorem –Stoke's theorem. Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential– Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first law. Laplace's and Poison's equations – Solution of Laplace's equation in one variable.

### UNIT – II: CONDUCTORS, DIELECTRIC & CAPACITANCE

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

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

### UNIT – III: MAGNETO STATICS, AMPERE'S CIRCUITAL LAW

Static magnetic fields – Biot-Savart's law – Oesterd's experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation. Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, Field due to a circular, rectangular and square loops.

**UNIT –IV: FORCE IN MAGNETIC FIELDS, MAGNETIC POTENTIAL**

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

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

**UNIT – V: INDUCTANCE, TIME VARYING FIELDS**

Self and Mutual inductance – Neumans's formulae – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field. Introduction to permanent magnets, their characteristics and applications.

Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation – Statically and Dynamically induced EMFs – Simple problems - Modification of Maxwell's equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

**TEXT BOOKS:**


1. Engineering Electromagnetics - *William H. Hayt & John. A. Buck* Mc. Graw-Hill Companies, 7th Editon, 2012.
2. Electromagnetic Fields - *Sadiku*, Oxford Publications, 7th edition, 2006.


**REFERENCE BOOKS:**


1. Introduction to Electro Dynamics - *D J Griffiths*, Prentice-Hall of India Pvt. Ltd, 2nd editon, 1989.
2. Electromagnetic - *J P Tewari*, Khanna Publishers, 2nd edition, 2005.
3. Electromagnetics - *J. D Kraus*, Mc Graw-Hill Inc, 4thedition 1992.
4. Electromagnetic fields - *S. Kamakshaiah*, Right Publishers, 2007.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. To have the knowledge on basics of electro static field, magneto static field, time varying fields which are used in Electrical Engineering applications.
2. To understand and analyze the boundary conditions in Electro static field, Magneto static field, Time varying fields, to determine field intensities, densities, circuit parameters for technologically importance structures.
3. To apply Maxwell's equations in Electro static field, Magneto static field, Time varying fields which will give the basics in Network analysis & Electrical Machines.
4. To give the experimental setups for fundamental loss like orestered experiment, Faraday's law, lenz's law, Faradays disc generator which will helpful in network analysis, electrical machines & power systems.

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**B.Tech EEE II Year I-Semester**

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## (A53013) ELECTRICAL MACHINES-I

**Prerequisite: - Physics.**

**Course Objectives :**

1. Provide the students a detailed knowledge regarding electrical DC machines.
2. Distinguish different dc machines according to their principle of operations and learn the behavior and response of different dc machines under different load conditions.
3. Strengthening knowledge of students regarding the construction and working principle of DC machines which will help them in design field.
4. Teach the students to calculate different parameters of different DC machines and also to follow numerous paths to get improvised result.

### UNIT – I: D.C. GENERATORS – CONSTRUCTION & OPERATION

D.C. Generators – Principle of operation – Action of commutator – constructional features – classification of DC generators – separately excited and self excited generators – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.F Equation – Problems – Armature reaction – cross magnetizing and demagnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation.

### UNIT –II: OPERATING CHARACTERISTICS OF D.C. GENERATORS

Build up of EMF – magnetization curve/OCC characteristics – critical field resistance and critical speed – causes of failure to self excite – remedial measures – load characteristics of D.C shunt, series and compound generators – parallel operation of D.C series generators – use of equalizer bar and cross connection of field windings – load sharing – problems and applications.

### UNIT – III: D.C. MOTORS

D.C Motors – Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation – speed control of D.C. Motors: armature voltage and field flux control methods – Ward-Leonard system.

### UNIT – IV: LOSSES AND EFFICIENCY OF DC MACHINES

Principle of 3 point and 4 point starters – protective devices.

Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency, numerical problems

### UNIT – V: TESTING OF D.C. MACHINES

Testing of D.C. machines: Methods of Testing – direct, indirect and regenerative testing – brake test – Swinburne's test – Hopkinson's test – Field's test – Retardation test – separation of stray losses in a D.C. motor test.

**TEXT BOOKS:**

1.Electric Machinery- *P.S. Bimbra*, Khanna Publishers, 7th edition, 2010,
2.Theory and performance of Electrical machines – *J.B Gupta*, S.K Kataria & Sons publishers, 2009.

**REFERENCE BOOKS:**

1.Electrical Machines – *S.K. Bhatta Charya*, Tata Mc. Hill Publications, 2007.
2.Electrical Machines - *I.J. Nagrath & Kothari*, Tata Mc Graw-Hill Publishers, 3rd edition, 2004.
3.Electric Machines – *M.V. Deeshpande*, Wheeler Publishing, 1997.

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Learn the detailed features of dc machines including construction and operation.
2. Know the EMF equations, torque equations, characteristics, starting methods of different electrical DC machines
3. Learn to calculate losses, efficiency, voltage regulation and other parameters of different machines and to know different operating conditions where one type of machine is replaced by other to get higher efficiency.
4. Get a glimpse of industrial scenario by correlating bookish knowledge to industrial concepts and to know the importance of modern speed control methods of dc drives.

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| **B.Tech EEE II Year I-Semester** | **L** | **P/D** | **C** |
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**(A53203) COMPUTER AIDED ELECTRICAL DRAWING LAB**

**Prerequisite: - None.**

**Course Objectives:**

1. To understand the terminology of electric circuit and electrical components.
2. To be able to familiarize with electrical machines, apparatus and appliances.
3. To acquire knowledge on various Electrical Engineering software's.

Draw the following using Electrical CADD / Corel Draw / MS Word / PPT/Visio

1. Lines, Arcs, Curves, Shapes, Filling of objects, Object editing & Transformation.
2. Electrical, Electronic & Electro – mechanical symbols.
3. House – wiring diagrams and layout.
4. Simple power and control circuit diagrams.
5. Electrical machine winding diagrams. (A.C & D.C)
6. Transmission tower, Over head lines – ACSR conductors, Single circuit, Double circuit, Bundle conductor.
7. Constructional features of D.C motors, AC motors and Transformers.
8. D.C and A.C motor starter diagrams.
9. Lamps used in illumination
10. Single line diagram of Power System

**TEXT BOOKS:**


1.Electrical Drawing By J.B.Gupta

2. KB. Raina & S.K. Bhattacharya, "*Electrical Design, Estimating and Costing"*, Wiley Eastern Ltd., 1991.

3.Nagrath & Kothari, "*Electrical Machines*", Tata McGraw Hill Publishing Company Ltd., 2000.

4.A.K. Sawhney*, "A Course in Electrical Machines Design"*, Dhanpat Rai and Sons, 1996.


**Course Outcomes**: After completing this course students must have the ability to

1. Identify and draw different components of electrical systems
2. Draw different control and wiring diagrams
3. Draw winding diagrams of electrical machines.

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**B.Tech EEE II Year I-Semester**

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## (A53204) ELECTRICAL CIRCUITS LAB

**Prerequisites:-Electrical Circuits**

**Course Objectives:**

1. To acquaint students with the basic concepts and properties of electrical circuits and networks; and provide hands on experience to the students so that they are able to put theoretical concepts to practice
2. Use computer simulation tools such as PSPICE, to carry out design experiments as it is a key analysis tool of engineering design.
3. Give a specific design problem to the students, which after completion they will verify using the simulation software or hardwired Implementation.
4. Understand the concept of circuit laws Solve the electrical network using mesh and nodal analysis by applying network theorems.

**PART-A: Electrical Circuits**

1) Verification of Kirchhoff's current law and Kirchhoff's Voltage law.
2) Verification of Thevenin's Theorem.
3) Verification of Norton's and Maximum Power Transfer Theorems.
4) Verification of Superposition theorem.
5) Verification of Compensation Theorem.
6) Verification of Reciprocity and Millmann's Theorems.
7) Series and Parallel Resonance.
8) Determination of Self, Mutual Inductances and Coefficient of coupling.
9) Verification of Z and Y Parameters.
10) Transmission and hybrid parameters.

**PART-B: Simulation**

1) Simulation of DC Circuits & AC Circuits.
2) Simulation of DC Transient response.
3) Simulation of Mesh Analysis.
4) Simulation of Nodal Analysis.

**NOTE:** Eight experiments are to be conducted from PART-A and any Two from PART-B

**Course Outcomes:**

1. Acquire knowledge and skills about electric instruments, such as millimeters, oscilloscope. Identify and learn properties about main electrical components, such as resistors, capacitors, inductors, voltage source, AC power sources and service equipment, transformers.
2. Explain the concept of circuit laws and network theorems and apply them to laboratory measurements.
3. Become proficient with computer skills (eg., OrCAD PSPICE) for the analysis and design of circuits
4. Acquire team work skills for working effectively in groups

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**B.Tech EEE II Year I Semester** | **L** | **P** | **C**
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## (A53007) GENDER SENSITIZATION
## (Mandatory Course)

**Course Objectives:**

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

**UNIT – I: UNDERSTANDING GENDER**

Gender: why should we study it? (Towards a world of Equals: UnIt-1)
Socialization: making women, Making Men (Towards a World of Equals: Unit-2)
Introduction. Preparing for Women hood. Growing up Male. First lessons in Caste. Different Masculinities.
Just relationships: Being Together as Equals (Towards a world of equals: Unit:12)
Marykom and Onler. Love and Acid just do not mix. Love letters. Mother's and Father's. Further Reading: Rosa Parks- the brave heart.

**UNIT – II : GENDER AND BIOLOGY**
Missing Women : Sex Selection and its Consequences (Towards a world of equals: Unit=-4)
Declining sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary(Towards aWorld of Equls: Unit-10)
Two or Many? Struggles with discrimination.
Additional Reading: Our bodies, our Health (Towards a world of Equals: Unit-13)

**UNIT – III : GENDER AND LABOUR**
Housework: the invisible Labour (Towards a world of Equals: Unit-3)
"My Mother doesn't work". "share the load"
Womens work: its politics and Economics (Towards a world of Equals: Unit-7)
Facts and Fictions. Unrecognized and unaccounted work. Further reading : wages and conditions of work.

**UNIT – IV : ISSUES OF VIOLENCE**
Sexual harassment: say No! (Towards a world of Equals: Unit-6)
Sexual harassment, not eve teasing- coping with everyday harassment further reading –"Chupulu"
Domestic violence: speaking out (Towards a world of Equals: Unit-8)
Is home a safe place? When Women unite(film) Rebuilding lives, Further Reading: New Forums for Justice
Thinking about Sexual Violence (Towards a world of Equals: Unit-11)
Blaming the Victim-"I fought for My life.."- Further Reading : The Caste of Violence.

**UNIT – V : GENDER STUDIES**

Knowledge: Through the lens of Gender (Towards a world of Equals: Unit-5)
Points of view. Gender and the Structure of Knowledge. Further Reading: Unacknowledged Women Artists of Telangana.
Whose History? Questions for historians and others(Towards a world of Equals: Unit-9)
Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

Essential Reading: All the Units in the Textbooks, "Towards a world of Equals: A bilingual Textbooks on Gender" written by A.Suneeta, Uma Bhrugubanda, Duggirals Vasanta, Rama Melkote, Vasudha nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Srinivas and Susie Tharu.
Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English, Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

**REFERENCE BOOKS:**


1. Sen Amartya, "More than one Million Women are Missing."New York review of Books 37.20(20 December 1990). Print."WE were making History…' Life Stories of Women in the Telangana Peoples Struggle. New Delhi: Kali for women. 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work. " Women's studies Journal (14 November 2012) Available online at: http;//blogs.wsj.com/India real time/2012/11/14/by- the numbers-where-Indian-Women Work/>
3. K. Satyanarayana and Susie Tharu (Ed.) Steal Nibs are Sprouting: New Delhi Writing from South India, Dossier2: Telugu and kannada http://harpercollins.co.in/BookDetails.asp?BookCode=3732
4. Vimala. "Vantillu (The Kitchen)."Women Writing in India: 600BC to the Present. Volume II. The 20th Century .Ed.Susie Tahru and K.Lalita. Delhi: Oxford University press. 1995.599-601
5. Shathrugna, Veena et al. Women's work and its impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research,1993.
6. Stree Shakti Sanghatana. "We were making history…'Life Stories of Women in the Telangana Peoples struggles New Delhi: Kali for Women. 1989
7. Menon , Nivedita. Seeing like a Feminst. New Delhi: Zubaan-Penguin Books.2012
8. Jayaprabha,A."Chupulu(Stares)". Women Writing in India:600BC to the present. Volume II: The 20th Century Ed. Susie tharu and K.Lalita Delhi: Oxford University press. 1995.596-597.
9. Javeed, Shayan and Anupam Manuhaar."Women and Wage Discrimination in India: A Critical Analysis." International Journal of Humanities and social Science Invention 2.4 (2013)
10. Gautam, Liela and Gita Ramaswamy. "A `conversation' between a daughter and a Mother." Broadsheet on Contemporary politics. Speical Issue on Sexuality and Harassment: Gender Politics on campus Today,Ed. Madhumeeta Sinha and Asma Rasheed, Hyderabd: Anveshi Research Center for Women's Studies 2014.
11. Abdulali Sohaila. " I fought fro my life.. and won." Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my life and won-sohaila-abdhula/
12. Jeganathan Pradeep, partha Chatterjee (Ed). "Community, Gender and Voilence Suballern Studeis XI," Permanent Black and ravi Dayal Publishers, New Delhi, 2000.
13. K.Kapadia. the Violence of Development: The Politics of Identity, gender and Social Inequalities in India. London: Zed Books, 2002.
14. S.Benhabib. Situating the self: Gender, Community and Postmodernism in Contemporary Ethics, London Routledge, 1992.

15. Virginia woolf. A Room of One's Own. Oxford : Black Swan 1992.
16. T.Banuri and M. Mahmood, Just Development: Beyond Adjustment with a Human face, Karachi: Oxford University Press, 1997.

**Course Outcomes:**

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

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## (A54007) ELECTRONIC CIRCUITS

**Course Objectives:**

1. To explain the operation, design and analysis of multistage amplifiers using BJT and MOSFET.
2. To analyze feedback amplifiers, large signal and tuned amplifiers.
3. To analyze different oscillators

**UNIT-I: SINGLE STAGE AMPLIFIERS DESIGN AND ANALYSIS**

Review of CE, CB, CC& CS amplifiers-Classification of Amplifiers, Distortion in amplifiers-Approximate analysis, CE, CB, CC amplifiers comparison.

**BJT& FET FREQUENCY RESPONSE** - Low frequency analysis-Low frequency response of BJT amplifiers-Low frequency response of FET amplifier-Miller effect capacitance-High frequency response of BJT amplifier-Square wave testing

**UNIT-II : MULTI STAGE AMPLIFIERS**

Analysis Of Cascaded RC Coupled BJT Amplifiers, Cascode Amplifiers, Darlington Pair, Different Coupling Schemes Used In Amplifiers- RC Coupled Amplifiers, Transformer Coupled Amplifiers And Direct Coupled Amplifiers.

**UNIT III: LARGE SIGNAL AMPLIFIERS**

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

**UNIT IV: CLIPPERS AND CLAMPERS**

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

**UNIT V: SWITCHING CHARACTERISTICS OF DEVICES**

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

**MULTIVIBRATORS**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**Course Outcomes :**

After going through this course the student will have ability to

1. Apply the knowledge of BJT to design practical amplifier circuits.
2. Design electronic sub systems such as feedback amplifiers, oscillators and power amplifiers to meet the required specifications.
3. Design clamper and clipper circuits with different inputs.

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**B.Tech EEE II Year II-Semester**

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## (A54008) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

**Prerequisites:-None**

**Course Objectives:**

1. To teach the fundamentals of the key elements of a business organization.
2. To provide a critical perspective on theoretical knowledge and practical approach to various functional areas of management and decision making.
3. To provide insights on Finance and Economics concepts and to built team work and leadership skills within them

**UNIT – I**

**INTRODUCTION TO MANAGERIAL ECONOMICS:** Definition, Nature and scope of Managerial Economics, Demand Analysis- Demand Determinants, Law of Demand and its exceptions.

**ELASTICITY OF DEMAND:** Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Methods of Demand Forecasting (Survey Methods, Statistical Methods, Expert Opinion Method, Test Marketing, Controlled Experiments, Judgmental Approach to Demand Forecasting)

**UNIT – II**

**THEORY OF PRODUCTION AND COST ANALYSIS:** Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economics of Scale.

**COST ANALYSIS:** Cost concepts, Opportunity Cost, Out of Pocket Costs vs. Imputed Costs. Breakeven Analysis (BEA) – Determination of Breakeven Point (simple problems), Managerial Significance and limitations of BEA.

**UNIT – III**

**MARKET STRUCTURES:** Types of Competition, Features of Perfect Competition, Monopoly and Monopolistic Competition, Price - Output determination in Perfect Competition and monopoly.

**OBJECTIVES AND POLICIES OF PRICING:** Objectives of pricing**,** Methods of Pricing - Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two - Part Pricing, Block Pricing, Peak Load Pricing, Cross Subsidization.

**UNIT – IV**

**CAPITAL AND CAPITAL BUDGETING:** Capital and its significance, Types of Capital, Estimation of Fixed and Working Capital requirements. Nature and scope of Capital Budgeting, features of Capital budgeting proposals, Methods of Capital Budgeting- Payback Method,

Accounting Rate of Return (ARR) and Net Present Value Method, Profitability Index, Internal Rate of Return ( simple problems).

**UNIT – V**

**INTRODUCTION TO FINANCIAL ACCOUNTING:** Accounting, Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

**FINANCIAL ANALYSIS THROUGH RATIOS:** Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and Quick Ratio), Activity Ratios ( Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios ( Debt – Equity, Interest Coverage Ratio), and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Profit Ratio, P/E Ratio and EPS).

**TEXT BOOKS:**


1. Managerial Economics and Financial Analysis - *Aryasri*, TMH, 2012.
2. Managerial Economics - *Varshney & Maheshwari, Sultan Chand & Sons*, 2014.
3. Managerial Economics and Financial Analysis - *S.A. Siddiqui and A.S. Siddiqui*, New Age International Publishers, Hyderabad, 2013.


**REFERENCE BOOKS:**


1. Managerial Economics & Financial Analysis - *Raghunatha Reddy & Narasimhachary*, Scitech, 2009.
2. Financial Accounting - *V. Rajasekaran & R. Lalitha*, Pearson Education, New Delhi, 2010.
3. Managerial Economics in a Global Economy - *Domnick Salvatore*, 4th Edition, Cengage, 2009.
4. Financial Accounting for Management - *Subhash Sharma & M. P. Vittal*, Text & Cases, Machmillan, 2012.
5. Financial Accounting - *S. N. Maheshwari & S. K. Maheshwari*, Vikas 2012.
6. Managerial Economics; Analysis - *Truet and Truet*, Problems and Cases, Wiley, 2012.
7. Managerial Economics - *Dwivedi*, Vikas 2012.
8. Managerial Economics and Financial Accounting-*M. Kasi Reddy and S.Saraswathi*, PHI, 2012.
9. Techniques of Financial Analysis - *Erich A. Helfert*, Jalco, 2007.


**Codes / Tables**: Present Value Tables need to be permitted into the Examination Hall

**Course Outcomes:**

On completion of this course, the graduate should be able

1. To have the knowledge on various Finance and Economic concepts of business management and approaches.
2. To understand and analyze the interconnections between the development of key functional areas of business organization and the management thought process.
3. To be ethically conscious and socially responsible managers, capable of contributing to the development of the nation and quality of life.

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## (A54009) POWER SYSTEMS-I

**Prerequisites:-None**

**Course Objectives:**

1. To explain the various generation sources such as Hydal, Thermal, Nuclear and Gas Power plants
2. To describe DC and AC distribution systems and its voltage drop calculations
3. To illustrate various Economic aspects of the Power plant erection, operation and different Tariff methods.
4. To describe the transmission line parameters and its calculations

### UNIT-I: HYDEL, THERMAL AND NUCLEAR POWER STATIONS

Generating Stations – Classification

**Hydro Electric Power Stations:** Layout of Hydro station- selection of site – classification of hydro plants – classification of turbines – constituents of hydro station –Equation of power generation - numerical problems.

**Thermal Power Stations:** Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses.- Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers, numerical problems.

**Nuclear Power Stations**: Nuclear Fission and Chain reaction - Nuclear fuels - Principle of operation of Nuclear reactor.-Reactor Components: Moderators, Control rods, Reflectors and Coolants - Radiation hazards: Shielding and Safety precautions.- Types of Nuclear reactors and brief description of PWR, BWR and FBR.

### UNIT- II: GAS POWER STATIONS, SUBSTATIONS AND GAS INSULATED SUBSTATIONS (GIS)

**Gas Power Stations:** Principle of Operation and Components (Block Diagram Approach Only)

Classification of substations: Air insulated substations - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

**Gas insulated substations (GIS)** – Advantages of Gas insulated substations, single line diagram of gas insulated substations, bus bar, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

### UNIT- III: DC AND AC DISTRIBUTION SYSTEMS

Classification of Distribution Systems - Comparison of DC vs AC and Under-Ground vs Over - Head Distribution Systems- Requirements and Design features of Distribution Systems.

**D.C. Distribution Systems**: Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

**A.C. Distribution Systems**: Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

**UNIT- IV: ECONOMIC ASPECTS OF POWER GENERATION AND TARIFF METHODS**

Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.

**Tariff Methods:** Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method - Tariff Methods: Flat Rate, Block-Rate, two-part, three – part, and power factor tariff methods and Numerical Problems.

**UNIT-V: POWER FACTOR AND VOLTAGE CONTROL, DEPENDENCY OF VOLTAGE ON REACTIVE POWER FLOW**

Causes of low p.f - Methods of improving p.f -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical p.f. for constant KW load and constant KVA type loads, Numerical Problems.

Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers

**TEXT BOOKS:**


1. A course in power systems - *J.B. Gupta,* S. K. Kataria & Sons, 2009.
2. Principles of Power Systems - *V.K Mehta and Rohit Mehta,* S.Chand& Company Ltd., New Delhi 2004.
3. GIS - M.S.Naidu


**REFERENCE BOOKS:**


1. A Text Book on Power System Engineering - *M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti,* Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Elements of Power Station design and practice - *M.V. Deshpande*, PHI, 2010.
3. Electrical Power Generation, Transmission and Distribution - *S.N.Singh.*, PHI 2003.
4. Gas turbine performance- *PP Wals, P.Fletcher*, Blackwell Publisher, 2004
5. Generation, distribution and utilization of Electrical energy- *C.L.Wadhawa*, New age International (P) Limited, Publishers 1997.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Be conversant with the various types of generating stations and distribution systems of power along with the economic aspects.
2. Understand the power factor and the need of power factor Control.
3. Understand the mechanical design of transmission lines, cables and insulators
4. To illustrate Power factor, Voltage Control, and Reactive Power Flow control

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## (A54010)CONTROL SYSTEMS

**Perquisites:- Electrical Circuits and Network Theory**

**Course Objectives:**

1.To teach the fundamental concepts of control systems & mathematical modelling of the system
2.To study the concept of time response & frequency response of the system
3.To teach the basics of stability analysis of the system
4.To teach the classical control design techniques & state space analysis

### UNIT – I: INTRODUCTION TO CONTROL SYSTEM

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.

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

### TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor – AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

### UNIT-II: TIME AND FREQUENCY RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants. Sinusoidal transfer function , Determination of Frequency domain specifications

### UNIT –III: STABILITY ANALYSIS IN FREQUENCY DOMAIN

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

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

Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar plots and Nyquist Plots -.Nyquist stability criterion.

### UNIT – IV: CLASSICAL CONTROL COMPENSATION DESIGN TECHNIQUES

P,PI,PD and PID controllers determination of coefficient's.

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain,

**UNIT – V :STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS**

Concepts of state, state variables and state model, derivation of state models - Solving the Time invariant state Equations- State Transition Matrix and its Properties.

**TEXT BOOKS:**


1. Control Systems Engineering – *I.J.Nagrath and M.Gopal*, New Age International(P) Limited, Publishers, 2nd edition, 2009.
2. Automatic Control Systems - *B. C. Kuo*, John wiley and son's., 8th edition, 2003.
3. Control Systems - Jagan


**REFERENCE BOOKS:**


1. Modern Control Engineering –*Katsuhiko Ogata* – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems - *N.K.Sinha*, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. – *John wiley*, NISE, 4rd edition, 2007.
4. Control Systems – *Nagoorkani*, 1998.
5. Control Systems - *Anand Kumar*


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Analyze electromechanical systems by mathematical modeling
2. Determine the response of different order systems using standard test signals
3. Analyze the stability of the system
4. Identify & design a control system satisfying requirements, determining the state space representation

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## (A54006) ENVIRONMENTAL STUDIES

**Prerequisite:- None**

**Course Objectives:**

1. To introduce the knowledge about Environment.
2. To introduce students to the concepts of pollution, Biodiversity
3. To develop an awareness about global Environmental problems.
4. To learn to protect environment, legal issues, Sustainable development.

### UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness.

**Ecosystems**: Concept of an ecosystem – Classification, structure and function of different ecosystems - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids.

**Biodiversity and its conservation**: Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. ICUN categories of biodiversity and RED DATA book - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### UNIT – II: NATURAL RESOURCES

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

### UNIT – III: ENVIRONMENTAL POLLUTION

Definition, Cause, effects and control measures of different kinds of pollution ( Air, Water , Soil , Marine , Noise , Thermal, Nuclear, e –Waste)

**Social Issues and the Environment**: From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, and watershed management. -Climate change, global warming, ozone layer depletion, nuclear accidents and holocaust.

**UNIT – IV**

**WASTE MANAGEMENT TECHNOLOGY:** Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides.

Waste water and sewage treatment technology: primary, secondary and tertiary treatments. Bioremediation, Phyto-remediation, ZLD (zero liquid discharge), membrane technology. Application of GIS and GPS system in environmental science.

**ENVIRONMENTAL POLICY, RULES AND REGULATIONS:** EIA (Environmental Impact Assessment) & EMP (Environmental Management Plan) – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act - Wildlife Protection Act –Forest Conservation Act.-Public awareness. Global environmental problems and global efforts.

**UNIT – V**

**TOWARDS SUSTAINABLE FUTURE**: concept of sustainable development, threats of sustainability, population and its explosion, over exploitation of resources, strategies for achieving sustainable development. Environmental education, Conservation of resources. Urban sprawl, sustainable cities and sustainable communities, human health. Role of IT in environment, environmental ethics, concept of green building, Basic principles of Green engineering, clean development mechanism (CDM), Low carbon life cycle, Polluters-pay principle.

**FIELD WORK:** Visit to a local area to document environmental assets River/forest Grassland / hill / mountain Visit to a local polluted site – Urban / Rural / industrial/ Agricultural Study of common plants, insects, birds, Visit to effluent treatment Plant/sewage treatment plant Study of simple eco systems pond, river, hill slopes, etc.

**Mini projects by students which is mandatory.**

**TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses - *Erach Bharucha*, University Grants Commission, University Press.
2. Environmental studies From Crisis to cure - *R.Rajagopalan*, 2005

**REFERENCE BOOKS:**


1. Environmental Science: towards a sustainable future - *Richard T.Wright*., PHI Learning Private Ltd ., New Delhi, 2008.
2. Environmental Engineering and science - *Gilbert M.Masters and Wendell P.Ela*., PHI Learning Pvt. Ltd., 2008.


**Course Outcomes:**

1. Conservation of natural resources
2. Understand Requirement to conserve environment.
3. Understand the National and international efforts to save globe.
4. Know importance of sustainable development

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**B.Tech EEE II Year II-Semester**

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## (A54011)ELECTRICAL MACHINES – II

**Prerequisites:- Electrical Machines-I, Electromagnetic Fields**

**Course Objectives:**

1. Provide the students a detailed knowledge regarding 1-Φ & 3-Φ Transformers and 3-Φ & 1-Φ induction machines.
2. Provide the students a detailed knowledge regarding parallel operation of Transformers and to learn different connection of transformers.
3. Strengthening knowledge of students regarding the operation of transformers and Induction motors at different power factor and also the speed control methods of induction motors.
4. Teach the students to calculate different parameters of induction motor from circle diagram and from the tests conducted on transformers.

**UNIT-I: SINGLE PHASE TRANSFORMERS**

Types: - core and shell type - constructional details- minimization of hysteresis and eddy current losses-emf equation - operation on no load and on load - phasor diagrams.

Equivalent circuit - losses and efficiency-regulation. All day efficiency - effect of variations of frequency & supply voltage on iron losses.

**Performance of transformers :** OC and SC tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test.

**Auto transformers**- auto transformers- equivalent circuit - comparison with two winding transformers.

**UNIT II:**

**THREE PHASE TRANSFORMERS**

Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Third harmonics in phase voltages-three winding transformers-tertiary windings. Determination of Zp, Zs and Zt transients in switching - off load and on load tap changing; Scott connection.

**PARALLEL OPERATION OF TRANSFORMERS**

Parallel operation single phase transformers with equal and unequal voltage ratios – Problems-Parallel operation of three phase transformers ( Basic concepts only)

**UNIT III: THREE PHASE INDUCTION MOTORS**

Construction details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor emf and rotor frequency - rotor reactance, rotor current and pf. at standstill and during operation. Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation-deduction from torque equation - expressions for maximum torque and starting torque - torque slip characteristic - double cage and deep bar rotors - equivalent circuit - phasor diagram - crawling and cogging.

**UNIT IV**: **PERFORMANCE OF THREE PHASE INDUCTION MOTORS**

Circle diagram-no load and blocked rotor tests-predetermination of performance.

Methods of starting DOL, star-delta, auto transformer, starting current and torque calculations of Induction Motors.

Speed control-change of frequency- change of poles and methods of consequent poles; cascade connection. Injection of an emf in to rotor circuit (qualitative treatment only)-induction generator-principle of operation. applications

**UNIT V: SINGLE PHASE INDUCTION MOTORS**

Single phase Induction motor – Constructional features- Double revolving field theory Equivalent circuit- spilt –Phase motors- Capacitor start Capacitor run motors. applications.

**TEXT BOOKS:**


1. Electric Machinery- *P.S. Bimbra,* Khanna Publishers, 7th edition, 2010.
2. Theory and Performance of Electrical Machines - *JB Gupta,* SK Kataria & lSons, 2009.


**REFERENCE BOOKS:**


1. Performance and Design of AC Machines - *MG.Say*, BPB Publishers, 1968.
2. Theory of Alternating Current Machinery- *Langsdorf*, Tata McGraw-Hill Companies, 2nd edition, 2001.
3. Electromechanics-II (transformers and induction motors) - *S. Kamakashaiah,* Hitech publishers.
4. Electric Machines – *I.J.Nagrath & D.P.Kothari*,Tata Mc Graw Hill, 7th Edition, 2005.
5. Electrical machinery - *A.E. Fritzgerald C. Kingsley and S. Umans*, Mc Graw-Hill Companies, 5th edition, 2010


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Learn the detailed features of 1-Φ & 3-Φ Transformers and 3-Φ & 1-Φ induction machines including construction and operation.
2. Know Different Tests of Transformers and Induction motors and to know Three winding transformer, three phase Induction motor and its equivalent circuits.
3. Learn to calculate losses, efficiency, voltage regulation and other parameters of transformers and induction motors and to know magnetic inrush current of transformer and harmonic reduction.
4. Get a glimpse of industrial scenario by correlating bookish knowledge to industrial concepts and to know the importance of modern speed control methods of induction motor.

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## (A54204) ELECTRICAL MACHINES LAB -1

**Prerequisites:- Electrical Machines-I**

**Course Objectives:**

1. The ability to conduct testing and experimental procedures on different types of electrical machines.
2. A chance to practice different types of wiring and devices connections.
3. The capability to analyze the operation of electric machines under different loading conditions

The following experiments are required to be conducted compulsory

**Experiments:**

1. Magnetization characteristics of DC shunt generator.
2. Load test on DC shunt generator.
3. Load test on Dc series generator.
4. Load test on DC compound generator.
5. Hopkinson's tests on DC shunt machines.
6. Fields test on DC series machines.
7. Swinburne's test on DC shunt machine.
8. Speed control of DC shunt motor.
9. Brake test on DC shunt motor.
10. Brake test on DC compound motor.
11. Separation of losses in DC shunt motor.
12. Retardation test on DC shunt motor.

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. The ability to select a suitable measuring instrument for a given application.
2. The skill to analyze the response of any electrical machine.
3. Ability to conduct experiments on DC Machines to find the characteristics.
4. The ability to troubleshoot the operation of an electrical machine.

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## (A54205) ELECTRONIC DEVICES AND CIRCUITS LAB

**PART A: (Only for Viva-voce Examination)**

**ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):**

1. Identification, Specifications, Testing of R, L, C, Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
2. Identification, Specification and Testing of Active Devices, Diodes, BJT's LOW power JFET's MOSFET's, Power Transistors, LED's, SCR, UJT.
3. Study and operation of
   - Multi-meters (Analog and Digital**)**
   - Regulated Power Supplies
   - Function Generator
   - CRO

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

1. Forward & Reverse Bias Characteristics of PN Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Half Wave Rectifier with & without filets.
4. Full Wave Rectifier with & without filters
5. Input &output characterizes of Transistor in CB Configuration.
6. Input &output Characteristic of Transistor in CE Configuration.
7. FET characteristics.
8. Measurement of h parameters of transistor in CB, CE, CC configurations
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of FET Amplifier (Common source).
12. SCR Characteristics
13. UJT Characteristics.

**PART C: Equipment required for laboratories:**

1. Regulated power supplies (RPS)
2. CRO's - (0-20) MHZ
3. Function Generator - (0-1) MHZ
4. Multimeters
5. Decade Resistance Boxes / Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital) - (0-20) pA, (0-50) pA, (0-100) pA, (0-200) pA, (0-10) mA
8. Voltmeters (Analog or Digital) - (0-50) V, (0-100) V, (0-250) V
9. Electronic Components - Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, diodes - Ge & Si type, Transistors – Npn & pnp type

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## (A55012) ELECTRICAL MEASUREMENTS

**Prerequisite: Electromagnetic Fields, Electrical Circuits.**

**Course Objectives:**

1. Introduction to common measuring instruments, and their application to electrical measurements.
2. Identify and classify error sources, and explain how their effects can be minimized
3. To understand the basic design techniques of measuring devices.
4. To know the industrial and laboratory applications.

**UNIT-I : MEASURING INSTRUMENTS**

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – Extension of range of Electrostatic Voltmeters.

**UNIT-II : INSTRUMENT TRANSFORMERS**

CT and PT – Ratio and phase angle errors – design considerations- Type of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters – Frequency meters – Resonance type and Weston type – Synchroscopes.

**UNIT-III : MEASUREMENT OF POWER AND ENERGY**

Single phase dynamometer wattmeter, LPF and UPF, Double element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems

Single phase induction type energy meter – driving and braking torques – errors and compensations – testing. Three phase energy meter – trivector meter, maximum demand meters.

**UNIT IV: POTENTIOMETERS AND MAGNETIC MEASUREMENTS**

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage.A.C. Potentiometers: polar and coordinate types– applications.

**Magnetic Measurements**: Ballistic galvanometer, flux meter.

**UNIT-V: MEASUREMENT OF R, L & C**

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty bridge.Wien's bridge – Schering Bridge.

**TEXT BOOKS:**

1. Electrical & Electronic Measurement & Instruments - *A.K.Sawhney* , Dhanpat Rai & Co. Publications, 3rd Edition

**REFERENCE BOOKS:**

1. Electrical Measurements – *Buckingham and Price*, PHI
2. Electrical Measurements: Fundamentals, Concepts, Applications – *Reissland, M.U,* New Age International (P) Limited, Publishers.
3. Electrical Measurements and measuring Instruments – *E.W. Golding and F.C. Widdis*, 5th Edition, Wheeler Publications.

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability

1.To understand working of various types of meters and their construction
2.To analyze the mathematical concepts of measuring instruments.
3.To service and maintain such meters in case of damage or misuse,
4.To design and create novel measuring instruments and solutions for real life problems.

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## (A55013) OPTIMIZATION TECHNIQUES
## (Professional Elective - I)

**Course Objectives**:

1. To learn different Optimization Techniques.
2. To learn and solve the problems using linear, non linear programming and transportation problems
3. To solve problems using constrained and un constrained programming methods
4. To learn the dynamic programming method

### UNIT – I : INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.

Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

### UNIT – II : LINEAR PROGRAMMING AND TRANSPORTATION PROBLEM

**Linear Programming:**

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

**Transportation Problem:**

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

### UNIT – III: UNCONSTRAINED NONLINEAR PROGRAMMING AND OPTIMIZATION TECHNIQUES

**Unconstrained Nonlinear Programming:**

One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method

**Unconstrained Optimization Techniques**

Univariate method, Powell's method and steepest descent method.

**UNIT – IV: CONSTRAINED NONLINEAR PROGRAMMING**

Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

**UNIT – V: DYNAMIC PROGRAMMING**

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

**TEXT BOOKS:**


1. Engineering optimization: Theory and practice- *S. S.Rao*, New Age International (P) Limited, 3rd edition, 1998.
2. Operations Research – *Dr. S.D.Sharma*, Kedar Nath Ram Nath and Co. ,Meerut, 10th edition, 1992
3. Optimization Methods in Operations Research and systems Analysis" – *K.V. Mital and C. Mohan*, New Age International (P) Limited, Publishers, 3rd edition, 1996.


**REFERENCE BOOKS:**


1. Introductory Operations Research - *H.S. Kasene & K.D. Kumar*, Springer(India), Pvt. Ltd.
2. Operations Research : An Introduction – *H.A. Taha*, PHI Pvt. Ltd., 6th edition, 2012.
3. Linear Programming – *G. Hadley, Addison*- Wesley Publishing Co, 1963.


**Course Outcomes:**

After the completion of this course students will be able to

1. Know the concepts of optimization techniques
2. Understands the problem solving methods in different conditions
3. Solve different real time problems under different constraints by applying suitable methodologies
4. Analyze the problems for better output

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## (A55014) RENEWABLE ENERGY SOURCES

**(Professional Elective - I)**

**Prerequisite: Power Systems-I**

**Course Objectives:**

1. Ability to understand about wind turbines, Geothermal energy sources, ocean energy and Bio conversion process.
2. Ability to learn Renewable energy sources, generating systems, its performance characteristics and potential in India
3. Ability to apply the knowledge to solve the present issues in power world.
4. Ability to design solar panels such as flat plate collectors, dish collectors, fuel cells and etc.,

**UNIT – I : SOLAR RADIATION AND SOLAR ENERGY COLLECTION**

**Principles of Solar Radiation**: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**Solar Energy Collection**: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**UNIT-II : SOLAR ENERGY STORAGE AND APPLICATIONS**

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT-III : WIND ENERGY AND BIO-MASS**

**Wind Energy**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

**Bio-Mass**: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

**UNIT-IV : GEOTHERMAL, OCEAN, TIDAL AND WAVE ENERGY**

**Geothermal Energy**: Resources, types of wells, methods of harnessing the energy, potential in India.

**Ocean Energy**: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

**Tidal and Wave energy:** Potential and conversion techniques, mini-hydel power plants, and their economics.

**UNIT-V : DIRECT ENERGY CONVERSION**

Need for DEC, Carnot cycle, limitations, principles of DEC. Seebeck effect, MHD generators (Ideal and Practical).

**TEXT BOOKS:**

1. Non-Conventional Energy Sources - *G.D. Rai*, Khanna Publishing House, 2011.
2. Renewable Energy Technologies - *Ramesh & Kumar* , Narosa Publishing House.

**REFERENCE BOOKS:**

1. Renewable energy resources- *Tiwari and Ghosal*, Narosa Publishing House, 2007.
2. Non-Conventional Energy - *Ashok V Desai,*Wiley Eastern Ltd, New Delhi, 2003.
3. Non-Conventional Energy Systems - *K Mittal*, Wheeler Publishing Co.
4. Solar Energy – *Sukhame*, Tata McGraw-Hill Education, 3rd edition, 2008

**Course Outcomes**

After completing this course the student must demonstrate the knowledge and ability to

1. To gain knowledge on setting of solar power generating system, wind turbines, geo thermal energy generating system, ocean thermal energy generating system and etc.,
2. Understanding the Non conventional energy sources and types of energy generating systems, construction, principle, operation and applications
3. Ability to learn Renewable energy sources, generating systems, its performance characteristics and potential in India
4. Ability to design solar panels such as flat plate collectors, dish collectors, fuel cells and etc.,

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## (A55015) LINEAR SYSTEM ANALYSIS

**(Professional Elective-I)**

**Prerequisite: Control Systems, Electrical Circuits**

**Course Objectives:**

1. To find the Fourier transforms of some common signals using Laplace Transform and Parsevals theorem.
2. To test the polynomials using Sturms theorem and reliability of elements.
3. To evaluate linear system programming for different approaches like foster and cauer methods and theorems.
4. To Design Network Synthesis using foster and Cauer methods for RL and RC networks

**UNIT-I: STATE VARIABLE ANALYSIS**

Choice of state variables in Electrical networks-Formulation of state equations for Electrical networks-Equivalent source method. Network topological method - Solution of state equations-Analysis of simple networks with state variable approach.

**UNIT–II : FOURIER SERIES AND FOURIER TRANSFORM REPRESENTATION**

Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry, Fourier integrals and transforms, Fourier transform of a periodic function , Properties of Fourier Transform , Parseval's theorem , Fourier transform of some common signals, Fourier transform relationship with Laplace Transform.

Introduction, Effective value and average values of non sinusoidal periodic waves, currents, Power Factor, Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier Series.

**UNIT – III :**

**LAPLACE TRANSFORM APPLICATIONS**

Application of Laplace transform Methods of Analysis – Response of RL, RC, RLC Networks to Step, Ramp, and impulse functions, Shifting Theorem – Convolution Integral – Applications

**TESTING OF POLYNOMIALS & NETWORK SYNTHESIS**

Elements of reliability-Hurwitz polynomials-positive real functions-Properties-Testing-Sturm's Test, examples.

Synthesis of one port LC networks-Foster and Cauer methods-Synthesis of RL and RC one port networks-Foster and Causer methods

**UNIT-IV: SAMPLING**

Sampling theorem – Graphical and Analytical proof for Band Limited Signal impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function.

**UNIT-V : Z-TRANSFORMS**

Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z-Transform of a discrete sequence. Distinction between Laplace, Fourier and Z-Transforms. Region of convergence in Z-Transforms, constraints on ROC for various classes of signals, Inverse Z-Transform properties of Z-Transforms.

**TEXT BOOKS:**


1. Signals, Systems and Communications - *B.P. Lathi*, BS Publications 2003.
2. Network Analysis and Synthesis – *Umesh Sinha*- Satya Prakashan Publications.


**REFERENCE BOOKS:**


1. Linear System Analysis – *A N Tripathi*, New Age International, 2007.
2. Network and Systems – *D Roy Chowdhary*, New Age International, 2nd edition, 2005.
3. Engineering Network Analysis and Filter Desgin- *Gopal G. Bhise, Prem R. Chadha, Durgesh C. Kulshreshtha* - Umesh Publications, 2009.
4. Linear system anlysis - *A.Cheng*, Oxford publishers.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1.Ability to find the Fourier transforms using Laplace Transform and Perseval's theorem.
2.To test the polynomials using Sturms theorem and reliability of elements.
3.Know and be able to apply properties of linear time-invariant systems
4. Evaluate the convolution of an input waveform with an impulse response

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## (A55016) POWER ELECTRONICS

**Prerequisite: Electronic Devices and Circuits, Electrical circuits**

**Course Objectives:**

1. To understand and acquire knowledge about various power semiconductor devices
2. To analyze and design various power converter circuits
3. To know their applicability as per the specific requirement
4. Introduce hardware and software used in power electronic switching circuits

### UNIT-I : POWER SEMI CONDUCTOR DEVICES AND COMMUTATION CIRCUITS

Thyristors – Silicon Controlled Rectifiers (SCRs) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors .Basic theory of operation of SCR – Static characteristics and Dynamic characteristics of SCR - Turn on and Turn off times – Turn on and turn off methods- Salient points.

Two transistor analogy of SCR - UJT firing circuit - Series and parallel connections of SCRs Snubber circuit details – Specifications and Ratings of SCRs, BJT, IGBT - Numerical problems.

### UNIT-II: 1- PHASE HALF CONTROLLED AND FULLY CONTROLLED CONVERTERS

Phase control technique - Single phase Line commutated converters Midpoint and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load with continuous current mode of operation –Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Free wheeling Diode.

Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load for continuous current mode of operation. Derivation of average load voltage and current – Line commutated inverters. Active and Reactive power inputs to the converters without and with Freewheeling Diode. Effect of source inductance – Derivation of load voltage and current – Numerical problems.

### UNIT-III : THREE PHASE LINE COMMUTATED CONVERTERS

Three phase converters – Three pulse and six pulse converters – Midpoint and bridge connections average load voltage With R and RL loads.
Effect of Source inductance–Dual converters (both single phase and three phase) - Waveforms – Numerical Problems.

### UNIT-IV : AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

AC voltage controllers – Single phase two SCRs in anti parallel – With R and RL loads – modes of operation of Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms. Firing circuits -Numerical problems.

Cyclo converters – Single phase midpoint Cyclo converters with Resistive and inductive loads (Principle of operation only) – Bridge configuration of single phase Cyclo converter (Principle of operation only) – Waveforms

**UNIT-V : CHOPPERS AND INVERTERS**

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads for continuous and discontinuous current modes.

Step up Chopper – load voltage expression

Morgan's chopper – Jones chopper (Principle of operation only) -Waveforms - AC Chopper – Problems.

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter- Bridge inverters -$120^o$ and $180^o$ modes of operation – Waveforms – Simple forced commutation circuits for bridge inverters. Voltage control techniques for inverters-Pulse width modulation techniques – Numerical problems.

**TEXT BOOKS:**

1. Power electronics - *P.S. Bimbhra*- Khanna Publishers, $4^{th}$ Edition

**REFERENCE BOOKS:**

1. Power electronics – *M.D. Singh & K.B. Kanchandhani*, Tata Mc Graw – Hill Publishing Company, $2^{nd}$ edition.
2. Power Electronics: Circuits Devices and Applications – *M.H. Rashid*, Prentice Hall of India, $3^{rd}$ edition.
3. Power Electronics – *Vedam Subramanyam*, New Age International (p) Limited, Publishers.
4. Power Electronics – *P.C. Sen*, Tata Mc Graw-Hill Publishing.
5. Thyristorised power Controllers – *G.K. Dubey, S.R Doradra, A. Joshi and R.M.K. Sinha*, New Age international Pvt Ltd. Publishers latest edition

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Characteristics of various Power Electronics devices such as SCR, TRIAC, DIAC, IGBT, GTO etc.
2. To apply fundamental concepts of Power Electronics devices in Choppers, Inverters and Converters etc.
3. To identify basic requirements for power electronics based design application.
4. To understand the use of power electronics in commercial and industrial applications.

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## (A55017) POWER SYSTEMS-II

**Prerequisite: Power Systems-I**

**Course Objectives:**

1. To Evaluate basic theory of transmission lines, modeling and their performance analysis
2. To describe Traveling wave theory and derive expressions for reflection and refraction coefficients with various terminations of the lines
3. To perform sag-tension calculations and also describe various types of Insulators
4. To illustrate different types of cable and also describe grading of cables

### UNIT-I : TRANSMISSION LINE PARAMETERS

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

### UNIT-II: PERFORMANCE OF TRANSMISSION LINES

Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-$\pi$ and A, B, C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems, Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems.

Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves , Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent $\pi$ network models (numerical problems).

### UNIT-III: POWER SYSTEM TRANSIENTS

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions, Open Circuited Line, Short Circuited Line,T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

### UNIT-IV: PERFORMANCE OF TRANSMISSION LINES AND OVERHEAD LINE INSULATORS

Various Factors Governing the Performance of Transmission line and Overhead Line Insulators - Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation.

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

Types of Insulators, String efficiency and Methods for improvement, Numerical Problems voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

**UNIT-V: SAG AND TENSION CALCULATIONS AND UNDERGROUND CABLES**

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

Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems.

Capacitance of Single and 3-Core belted cables, Numerical Problems.
Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

**TEXT BOOKS:**


1. A Text Book on Power System Engineering- *M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy,* Dhanpat Rai & Co Pvt. Ltd.
2. Electrical power systems - *C.L.Wadhwa,* New Age International (P) Limited, Publishers,1998.


**REFERENCE BOOKS:**


1. Power system Analysis- *John J Grainger William D Stevenson*, TMC Companies, 4th edition
2. Power System Analysis and Design- *B.R.Gupta*, Wheeler Publishing.
3. Power System Analysis - *Hadi Saadat* – TMH Edition.
4. Modern Power System Analysis- *I.J.Nagarath and D.P.Kothari*, Tata McGraw Hill, 2nd Edition.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. To learn the concept of transmission lines, their parameters.
2. To understand the various problems arise in transmission like such as corona, Sag, Ferranti effect.
3. The investigate power factor improvement, capacitor bank installation in distribution system.
4. Design prototype model of small, medium and long transmission lines and calculate line parameters.

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**B.Tech EEE III Year I-Semester**

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## (A55018) ELECTRICAL MACHINES- III

**Prerequisite: Electrical Machines-I &II**
**Course objectives :**

1. Able to know theory and performance of Synchronous Generators.
2. To Understand the parallel operation of AC Generators.
3. To know the importance of Synchronous Motor in power Generation and Industry.
4. To have a brief idea about various special machines.

### UNIT-I : CONSTRUCTION-PRINCIPLE OF OPERATION & CHARACTERISTICS OF SYNCHRONOUS GENERATOR

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

### UNIT-II : VOLTAGE REGULATION OF SYNCHRONOUS GENERATORS

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

### UNIT-III : PARALLEL OPERATION OF SYNCHRONOUS GENERATORS

Synchronizing alternators with infinite bus bars – Synchronizing power and synchronizing torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance's. Numerical Problems.

### UNIT-IV : SYNCHRONOUS MOTORS

Principle of operation-methods of starting-phasor diagram-Variation of current and power factor with excitation-synchronous condenser-Mathematical analysis for power developed-circle diagrams of synchronous machines-hunting and its suppression-damper windings. Numerical Problems.

### UNIT-V : SPECIAL MOTORS

Basic Principle of operation and application of AC series motor-Universal motor-Stepper motor – shaded pole motor-Reluctance motor-BLDC motor (Elementary treatment only)

**TEXT BOOKS:**

1. Electrical Machinery – *P.S. Bimbra,* Khanna Publishers, 7th Edition.
2. Theory and Performance of Electrical machines - *J.B Gupta*, S.K. Kataria & Sons, 14th Edition.

**REFERENCE BOOKS:**

1. Electric Machines – *I.J.Nagrath & D.P.Kothari*, Tata Mc Graw-Hill Publishers, 3rd Edition 2006.
2. Electrical Machines- *Milukutla S Sarma, Mukesh K Pathak*, Cengage Learning, 2009.
3. Electric Machinery – *A.E. Fitzgerald, C.Kingsley and S.Umans*, Mc Graw-Hill Companies, 5th edition, 1990.
4. Electromachanics-III (Synchronous and single phase machines) - *S.Kamakashiah*, Right Publishers

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Learned the theory, operation and characteristics of Synchronous Generators.
2. Understood conditions to be fulfilled for parallel operation of AC Generators
3. Analyzed the improvement of power factor using Synchronous Motor.
4. Gained knowledge about special Motors used for various applications.

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| **B.Tech EEE III Year I-Semester** | **L** | **T** | **C** |
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## (A55019) SIGNALS AND SYSTEMS

**(Professional Elective – II)**

**Prerequisite: Mathematics I, II, III & IV**

**Course Objectives:**

1. To get basic knowledge about signals, systems and transformations
2. To know how to transfer signals through systems
3. To learn how to transform and correlating the signals, analyzing the systems
4. To learn and analyze the systems by writing the Laplace transforms and Z- transforms

### UNIT-I: SIGNAL ANALYSIS

Analogy between vectors and signals, Orthogonal vector and signal spaces, Approximation of a function by a set of mutually orthogonal functions, Evaluation of mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions, Trigonometric and Exponential Fourier series, Representation of periodic function by Fourier series Dirchelets Conditions, Complex Fourier spectrum, Deriving Fourier Transform (F.T.) from Fourier Series, F.T. of arbitrary and standard signals, Concept of impulse function, Fourier Transforms involving Impulse function, Properties of Fourier transforms, Sampling theorem and it's proof, Effect of under sampling-Aliasing , Reconstruction of signal from its samples.

### UNIT-II: SIGNAL TRANSMISSION THROUGH SYSTEMS

Linear system, Impulse response, Response of a Linear System, Linear Time-Invariant (LTI) system, Linear Time-Variant (LTV) System, Transfer function of LTI system, Filter characteristics of Linear Systems. Distortion-less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time.

### UNIT-III: CONVOLUTION AND CORRELATION OF SIGANLS

Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto correlation of functions, Properties of Correlation function, Energy density spectrum, Parse-val's Theorem, Power density spectrum, Relation between Autocorrelation function and Energy/Power spectral density function.

### UNIT-IV: LAPLACE TRANSFORMS

Review of Laplace transforms Partial fraction expansion, Inverse Laplace transform, Concept of Region of convergence (ROC) for Laplace transforms, Constraints on ROC for various classes of

signals, Properties of Laplace transforms, Relation between Laplace transform and Fourier transform of a signal. Laplace transform of certain signals using waveform synthesis.

**UNIT-V: Z-TRANSFORMS**

Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal signals, Periodicity of Discrete time complex exponential signal, Concept of Z-transform of a discrete sequence. Distinction between Laplace, Fourier and Z-Transforms. Region of convergence in Z-Transforms, Constraints on ROC for various classes of signals, Inverse Z-Transforms, properties of Z-Transforms.

**TEXT BOOKS :**


1. Signals, Systems & Communications - *B.P. Lathi*, BS Publications, 2003.
2. Signals and Systems - *A.V. Oppenheim, A.S. Willsky and S.H. Nawab*, PHI, 2nd Edn.


**REFERENCE BOOKS:**


1. Signals & Systems - *Simon Haykin and Van Veen*,Wiley, 2nd Edition.
2. Fundamentals of Signals and Systems - *Michel J. Robert*, MGH International Edition, 2008.
3. Signals, Systems and Transforms - *C. L. Philips, J.M.Parr and Eve A.Riskin*, Pearson education.3rd Edition, 2004.Publications, 2nd Edition, 2005.


**Course Outcomes:**

Upon completing this course the student will be able to:

1. Represent any arbitrary signals in terms of complete sets of orthogonal functions and understands the principles of impulse functions, step function and signum function.
2. Express periodic signals in terms of Fourier series and express the spectrum and express the arbitrary signal (discrete) as Fourier transform to draw the spectrum.
3. Understands the principle of linear system, filter characteristics of a system and its band width, the concepts of auto correlation and cross correlation and power Density Spectrum.
4. Can design a system for sampling a signal.
5. For a given system, response can be obtained using Laplace transform, properties and ROC of L.T. Study the continuous and discrete signal relation and relation between F.T., L.T. & Z.T, properties, ROC of Z Transform.

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**B.Tech EEE III Year I-Semester** **L T C**

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## (A55020) NEURAL NETWORKS & FUZZY LOGIC

**(Professional Elective – II)**

**Prerequisite:** Mathematics and set theory

**Course Objectives:**

1. This course introduces the basics of Neural Networks
2. Essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
3. It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components.
4. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented.

### UNIT – I: INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

### UNIT- II: ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

### UNIT–III: SINGLE LAYER FEED FORWARD NEURAL NETWORKS

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

### UNIT- IV: MULTILAYER FEED FORWARD NEURAL NETWORKS

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Associative Memories - Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative

Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm.

**UNIT – V: CLASSICAL & FUZZY SETS AND APPLICATIONS**

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

**Neural network applications:** Process identification, control, fault diagnosis and load forecasting.
**Fuzzy logic applications:** Fuzzy logic control and Fuzzy classification.

**TEXT BOOKS:**

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by *Rajasekharan and Rai* – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - *S.N.Sivanandam, S.Sumathi, S.N.Deepa,* TMH, 2006

**REFERENCE BOOKS:**

1. Neural Networks – *James A Freeman and Davis Skapura*, Pearson Education, 2002.
2. Neural Networks – *Simon Hakins* , Pearson Education
3. Neural Engineering - *C.Eliasmith and CH.Anderson*, PHI
4. Neural Networks and Fuzzy Logic System - *Bart Kosko*, PHI Publications

**Course Outcomes:**

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

1. Comprehend the concepts of feed forward neural networks
2. Analyze the various feedback networks.
3. Understand the concept of fuzziness involved in various systems and fuzzy set theory.
4. Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
5. Analyze the application of neural networks and fuzzy logic control to real time systems.

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## (A55021) FLUID MECHANICS AND HYDRAULIC MACHINERY

**(Professional Elective – II)**

**Prerequisite: Physics**
**Course Objectives:**

1. Learn the units and dimensions and their applications,
2. Study fluid statics and fluids in motion,
3. Study fluid behavior of fluids under various flow conditions and fluid friction in pipes
4. leading to design procedures for flow systems.
5. Principles of operation of different types of pumps and hydraulic machinery.

### UNIT – I : FLUID STATICS AND KINEMATICS

**Fluid Statics:** Dimensions and units: physical properties of fluids - specific gravity, viscosity, surface tension – vapour pressure and their influence on fluid motion – atmospheric, gauge and vacuum pressures – measurement of pressure – Piezometer, U-tube and differential manometers.

**Fluid Kinematics:** Steam line, path line and streak lines and steam tube, classification of flows-steady & unsteady, uniform & non uniform, laminar & turbulent, rational & irrational flows-equation of continuity for one dimentional flow and three dimentional flows.

### UNIT – II : FLUID DYNAMICS AND CLOSED CONDUIT FLOW

**Fluid Dynamics:** Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

**Closed Conduit Flow:** Reynold's experiment-Darcy Weisbach equation-Minor losses in pipes – pipes in series and pipes in parallel – total energy line – hydraulic gradient line.

Measurement of flow: pitot tube, venture meter and orifice meter, Flow nozzle.

### UNIT – III : TURBO MACHINERY AND HYDROELECTRIC POWER STATIONS

**Basics Of Turbo Machinery:** Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip velocity diagrams, work done and efficiency, flow over radial vanes.

**Hydroelectric power stations:** Elements of hydro electric power station- types –concept of pumped storage plants-storage requirements, mass curve(explanation only) estimation of power developed from a given catchment area, heads and efficiencies.

**UNIT – IV : HYDRAULIC TURBINES**

Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design – draft tube theory – functions and efficiency.

**UNIT – V: PERFORMANCE OF HYDRAULIC TURBINES AND CENTRIFUGAL PUMPS**

**Performance of Hydraulic Turbines:** Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

**Centrifugal Pumps:** Classification, working, work done – manometric head – losses and efficiencies, specific speed – pupms in series and parallel - performance characteristic curves, NPSH.

**TEXT BOOKS:**

1. Hydraulics, fluid mechanics and Hyraulic machinery - *Modi and Seth*.
2. Fluid Mechanics and Hydraulic Machines - *Rajput*.

**REFERENCE BOOKS:**

1. Fluid Mechanics and fluid power Engineering - *D.S Kumar*, Kotaria & sons.
2. Fluid Mechanics and machinery - *D. Rama Durgaiah*, New Age international.
3. Hydraulic Machines - *Banga & Sharma*, Khanna Publishers.

**Course Outcomes:**

After completion of this course the average student is expected to be able to

1. Learn the units and dimensions and their applications,
2. Study fluid statics and fluids in motion,
3. Study fluid behavior of fluids under various flow conditions and fluid friction in pipes leading to design procedures for flow systems.
4. Study the performance of Pumps and hydraulic machines.

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## (A55203) CONTROL SYSTEMS LAB

**Prerequisite: Control Systems**

**Course Objectives:**

1. To help the students understand and practice the modeling, simulation, and implementation of a physical dynamical system by a linear time invariant ordinary differential equation
2. To highlight the electrical modeling of a second order system and analyse the under-damped, over-damped and critically damped cases.
3. To study the effects of Lead, Lag and Lag-Lead series compensator on a second order system transient and steady state system response.
4. To familiarize students with Servo-Motor.

**Part - A**

1. Time response of Second Order System
2. Effect of P, PI, PID controller on a second order system
3. Characteristics of Synchros
4. Lead and Lag Compensation –Magnitude and phase plot
5. Characteristics of AC Servomotor
6. Effect of feedback on DC Servomotor
7. Transfer function of a DC motor

**Part – B**

8. simulation of OP-AMP based Integrator and Differentiator
9. Root Locus Plot, Bode Plot, Nyquist Plot and Polar Plot of Transfer Function
10. State space model for a given classical transfer function
11. Programmable Logic Controller
12. Temperature control using PID controller
13. Magnetic amplifier

**Note:-**All experiments from part A and Three experiments from part B to be conducted

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Evaluate the characteristics of a given AC and DC servo motor.
2. Determine the performance of first and second order systems in time domain.
3. Analyze second order systems using frequency domain analysis.
4. Design of feedback control systems

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## (A55204) ELECTRICAL MACHINES LAB-II

**Prerequisite: Electrical Machines II, III**

**Course Objectives:**

1. To prepare the students to have a basic knowledge of transformers.
2. To prepare the students to have a basic knowledge of induction motors.
3. To prepare the students to have a basic knowledge of alternators.
4. To know about an induction generator.

**Part A**

1. O.C. & S.C. Tests on single phase transformer.
2. Sumpner's test on a pair of single phase transformers.
3. Brake test on three phase squirrel cage induction motor.
4. No-load & blocked rotor tests on three phase Slip ring Induction motor.
5. Regulation of three phase alternator by synchronous impedance (EMF & MMF) method.
6. V and inverted V curves of three - phase Synchronous motor.
7. Equivalent circuit of single phase induction motor.
8. Slip test on salient pole synchronous machine.

**Part B**

1. Parallel Operation of Single Phase Transformers.
2. Separation of core losses of a single phase transformer.
3. Scott connection of Transformers.
4. Regulation of a three phase alternator by ZPF & ASA method.
5. Efficiency of a three phase alternator.
6. Measurement of sequence Impedance of a 3phase alternator.

**Note:-**All experiments from part A and Two experiments from part B to be conducted

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Have a basic knowledge of transformers, Induction motors and alternators.
2. Conduct experiments on Ac Machines to find the characteristics.
3. Perform test on synchronous Machine to find Direct and quadrature axis reactance.
4. Design a practical transformer.

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**(A55022) ENGLISH FOR LIFE SKILLS**

**(Mandatory Course)**

**Course Objectives**:

1. To increase the understanding of the world around and equip the learner to cope up with the challenges of life.
2. To help the students to accomplish the Life Skills which are associated with managing and leading a better life.
3. To equip the students with a set of Life Skills and increase their abilities for adaptive and positive behavior.

**UNIT-I**

"**Education: Indian and American" by *Anurag Mathur*** from **English for Life Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**"Teamwork Skills" by *SP Dhanavel*** from **English and Soft Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**UNIT-II**

**"Work"** by *D.H.Lawrence* from **English for Life Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**"Emotional Intelligence Skills" by *SP Dhanavel*** from **English and Soft Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**UNIT-III**

**"Learning Skills" by *SP Dhanavel*** from **English and Soft Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**UNIT-IV**

**"Problem-solving Skills" by *SP Dhanavel*** from **English and Soft Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**UNIT-V**

**"How Wealth Accumulates and Men Decay" by *G.B.Shaw*** from **English for Life Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**"Adaptability Skills" by *SP Dhanavel*** from **English and Soft Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

**TEXT BOOKS:**

1. English for Life Skills - *Orient Black Swan Private Limited*, Hyd, India.
2. English and Soft Skills - *SP Dhanavel* - Orient Black Swan Private Limited, Hyd, India.

**REFERENCE BOOKS:**

1. Life and Language, An Anthology of English Prose and Poetry - *Oxford University Press*, Delhi, India
2. Fluency in English II – *Promodini varma and Mukti Sanyal*, - Oxford University Press, Delhi, India
3. Essential life skills Form: I, II, III, IV - *E.Wachira Et al* - Oxford University Press, Delhi, India.

**Course Outcomes:**

1. Enrichment of human skills through language and literature
2. Building up confidence to deal effectively with the demands and challenges of everyday life.
3. Acquisition of psychosocial competency.

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### (A56012) SWITCH GEAR AND PROTECTION

**Prerequisite: Power Systems:-I, II**
**Course Objectives:**

1. To introduce students to power system protection and switchgear
2. To teach students theory and applications of the main components used in power system protection for electric machines, transformers, bus bars overhead and underground feeders
3. To teach students the theory, construction, applications of main types Circuit breakers, Relays for protection of generators, transformers and protection o f feeders from over-voltages and other hazards. It emphasis on neutral grounding for overall protection
4. To develop an ability and skill to design the feasible protection systems needed for each main part of a power system in students

**UNIT - I :CIRCUIT BREAKERS**

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages. - Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Auto reclosures.

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and $SF_6$ circuit breakers.

**UNIT-II: ELECTROMAGNETIC AND STATIC RELAYS**

Principle of Operation and Construction of Attracted armature, Balanced Beam, Induction Disc and Induction Cup relays.
Relays Classification: Instantaneous, DMT and IDMT types.

Applications of relays: Over current/ under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays.

Universal torque equation, Distance relays: Impedance, Reactance and Mho Relays.

Static relays:-introduction, phase comparators, amplitude comparators, static relays versus electromagnetic relays.

**UNIT-III : GENERATOR AND TRANSFORMER PROTECTION**

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on (%) Winding Unprotected.

Protection of transformers: Percentage Differential Protection, Numerical Problems on Design of CTs Ratio in differential protection, Buchholtz relay Protection.

**UNIT-IV: FEEDER AND BUS-BAR PROTECTION**

Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay.

Protection of Bus bars – Differential protection.

**UNIT-V : NEUTRAL GROUNDING AND PROTECTION AGAINST OVER VOLTAGES**

Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.
Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination.

**TEXT BOOKS:**

1. Power System Protection and Switchgear - *Badri Ram, D.N Viswakarma*, TMH Publications.
2. Switchgear and Protection – *Sunil S Rao*, Khanna Publishers

**REFERENCE BOOKS:**

1. Transmission network Protection -*Y.G. Paithankar*, Taylor and Francis, 2009.
2. Power System Protection and Switch Gear - *Bhuvanesh Oza*, TMH 2010.
3. Electrical Power systems – *C.L. Wadhwa*, New Age International (P) Limited, Publishers, $6^{th}$ Edition.

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Compare and contrast electromagnetic, static and microprocessor based relays
2. Select relay settings of over current and distance relays.
3. Analyze quenching mechanisms used in air, oil and vacuum circuit breakers
4. Apply technology to protect power system components.

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| **B.Tech EEE III Year II-Semester** | **L** | **T** | **C** |
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## (A56013) POWER SYSTEM OPERATION & CONTROL

**Prerequisite: Power Systems, Control Systems, Electrical Machines-III**

**Course Objectives:**

1. To provide the knowledge of optimization techniques used in the power system and Load Frequency Control (LFC).
2. To provide a solid foundation in mathematical models and engineering fundamentals required to control the governing system in Turbine models, hence the power system control.
3. To provide the knowledge of load scheduling of power plants.
4. To provide the knowledge of reactive power control and compensation

### UNIT - I : ECONOMIC OPERATION OF POWER SYSTEMS

Optimal operation of Generators in Thermal Power Stations, - Heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected.

Optimum generation allocation including the effect of transmission line losses – Loss coefficients, General transmission line loss formula.

### UNIT - II : HYDRO THERMAL SCHEDULING

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems-Short term hydrothermal scheduling problem.

### UNIT- III : MODELLING OF TURBINE, GENERATOR AND AUTOMATIC CONTROLLERS

Modelling of Governor: Mathematical Modelling of Speed Governing System – Derivation of small signal transfer function.

Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

Generator – Load Model.

Modelling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

**UNIT- IV : LOAD FREQUENCY CONTROL**

Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Controlled and Uncontrolled cases.

Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias Control Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

**UNIT-V : REACTIVE POWER CONTROL**

Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.

**TEXT BOOKS:**


1. Modern Power system Analysis - *D P Kothari and I J Nagrath* - Tata McGraw-Hill - 4th Edition.
2. Modelling of Power Systems – *P S R Murthy*– BS Publications.
3. Power System Operation and Control - *S.* Sivanagaraju - Pearson Education India, 1st Edition.


**REFERENCE BOOKS:**


1. Operation and Control In Power Systems - *P S R Murthy*.
2. Power generation, Operation and Control – *Allen J Wood.*
3. Power System Analysis – *C.L. Wadhwa*, Newage International – 6th Edition.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1) Get a knowledge on performance curves of power plants, importance of economic operation and LFC of interconnecting power system.
2) Be conversant with the concept and principle of optimal operation of interconnected and isolated of power plants and compensation of reactive power flow.
3) Apply the right methodologies to solve the issues in complex power system and analyze the systems based on their performance .
4) Analyze the steady state and dynamic behavior of the power system for voltage and frequency fluctuations also different compensating devices for reactive power flow control

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### (A56014) MICROPROCESSORS AND MICROCONTROLLERS

**Course Objectives:**

The student will be able to

1. Understand the memory system
2. learn concepts of microprocessor, different addressing modes and programming of
3. understand interfacing of 8086, with memory and other peripherals.
4. learn concept of DMA, USART RS-232 and PIC controller.
5. study the features of 8051 Microcontroller, its instruction set and also other controllers

**UNIT-I**

**COMPUTER ORGANIZATION:** Computer Types, Functional Unit, Basic Operational concepts, Data representation, Fixed Point Representation, Floating-point Representation.

**MEMORY SYSTEM:** Basic Concepts of Semiconductor RAM memories, ROM, Cache Memories, Virtual Memories, Secondary Storage Memories.

**UNIT – II**

**8086 MICROPROCESSOR ARCHITECTURE :** Functional diagram, register organization, memory segmentation, programming model, memory Addresses, physical memory organization, signal descriptions of 8086, common function signals, minimum and maximum mode signals, timing diagrams, interrupts of 8086.

**INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086:** Instruction formats, Addressing modes, Instruction set, assembler directives, macros, simple programs involving logical, ,arithmetic expressions and string manipulations.

**UNIT – III**

**8086 INTERFACING:** I/O Interface with 8255-PPI, various modes of operation and interfacing to 8086, Interfacing Keyboard, Display, stepper motor Interfacing, A/D & D/A Interfacing with advanced devices: Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine, Introduction to DOS, BIOS Interrupt, 8259 PIC architecture, Interfacing Interrupt Controller 8259 and 8257 DMA

Communication interface: Serial communication standards, Serial data transfer schemes, 8251 USART architectures and interfacing. RS-232C, IEEE-488. Prototyping and trouble

**UNIT – IV**

**INTRODUCTION TO MICROCONTROLLERS:** Overview of 8051 microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, simple programs with embedded-C.

**AVR RISC MICROCONTROLLER ARCHITECTURE:** AVR family Architecture, Register File, ALU, Memory access and instruction execution, I/O Memory, I/O ports, Timers, UART, Interrupt

Introduction to ARM Architecture and controllers.

**UNIT – V**

**8051 REAL TIME CONTROL:** Interrupts, timer /Counter and serial communication, programming external hardware interrupts, serial communication interrupts and timers and Counters

**TEXT BOOKS**:

1. Microprocessor and interfacing –*Douglas V Hall* – 2nd Edition, TMH publications.

2. The 8051 microcontroller- *Kenneth .J.Ayala*., 3rd edition., Cengage Learning,

**REFERENCE BOOKS:**

1. Advanced Microprocessors and peripherals – *A.K. Ray & Bhurchandi*, TMH publications.
2. The 8051 Micro controllers Programming – *Kenneth J Ayala* –3rd Edition- Penram International publications
3. Computer Organization- *Carl Hamacher, Zvonks vranesic, Safeazaky*,5th edition, TMH
4. Microcomputer systems – 8086/8088 family architecture –*Liu and GA Gibson*, 2nd
5. Micro controllers and application - *Ajay V Deshmukh*-TMGH- 2006
6. Computer Organization and System Architecture – *William Stallings*, Sixth Edition,

**Course Outcomes:**

After going through this course the student will be able to

1. Develop programs for different addressing modes.
2. Perform 8086 interfacing with different peripherals and implement programs.
3. Describe the key features of serial and parallel communication.
4. Design a microcontroller for simple applications.

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**(A56015) INSTRUMENTATION**

**Prerequisite: Electrical Measurements**

**Course Objectives:**

1. To introduce students to monitor, analyze and control any physical system.
2. To understand students how different types of meters work and their construction
3. To provide a student a knowledge to design and create novel products and solutions for real problems.
4. To introduce students a knowledge to use modern tools necessary for electrical projects.

**UNIT-I:**

**CHARACTERISTICS OF SIGNALS**

Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Random Errors.

**SIGNALS AND THEIR REPRESENTATION**

Signal and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation and pulse code modulation

**UNIT-II : OSCILLOSCOPES**

Cathode ray oscilloscope-Cathode ray tube-time base generator-horizantal and vertical amplifiers-CRO probes-applications of CRO-Measurement of phase and frequency-lissajous patterns-Sampling oscilloscope - analog and digital type

**UNIT-III :**

**DIGITAL VOLTMETERS**

Digital voltmeters- Successive approximation, ramp, dual-Slope integration continuos balance type-Micro processor based ramp type DVM digital frequency meter-digital phase angle meter

**SIGNAL ANALYZERS**

Wave Analyzers- Frequency selective analyzers, Heterodyne, Application of Wave analyzers-Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters

**UNIT-IV: TRANSDUCERS**

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Synchros, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

**UNIT-V : MEASUREMENT OF NON-ELECTRICAL QUANTITIES**

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow and Liquid level.

**TEXT BOOKS:**

1. Transducers and Instrumentation - *D.V.S Murthy*, Prentice-Hall Of India Pvt. Limited, 2nd edition, 2004.
2. A course in Electrical and Electronic Measurements and Instrumentation- *A.K. Sawhney*, Dhanpat Rai and Sons, New Delhi, 1999.

**REFERENCE BOOKS:**

1. Measurement Systems, Applications and Design – *Ernest O. Doebelin*, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.
2. Principles of Measurement and Instrumentation – *A.S Morris*, 2nd Edition, Prentice Hall of India, 2003.
3. Electronic Instrumentation- *H.S. Kalsi*, Tata MC-Graw Hill Edition, 1995.
4. Modern Electronic Instrumentation and Measurement techniques – *A.D Helfrick and W.D.Cooper*, Pearson/Prentice Hall of India, 2007.

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. To learn instrumentation systems having conversion from Non-electrical quantities
2. To understand instrumentation systems concerned with pressure, force, temp & flow etc
3. evaluate electronic instrumentation line Analog storage CROs and digital storage CROs etc
4. To design temperature related instrumentation of linear nature

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## (A56016) IC APPLICATIONS

## (Professional Elective – III)

**Course Objectives :**
The students will be able to

1. Study about electrical properties of analog ICs like Op-Amps, IC 555 timer, PLL.
2. Analyze and know the design concepts of various applications of ICs.
3. Study the design concepts Digital circuits using ICs.

### UNIT I: INTEGRATED CIRCUITS

**Introduction**: Classification. Chip Size and Circuit Complexity, Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics. 741 Op-Amp and its Features, Modes of operation-inverting, non-inverting, differential.

**Applications**: Basic Applications of Op-Amp, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converters, Sample & Hold Circuits, Differentiators and Integrators, Comparators, Schmitt Trigger, Multivibrators. Introduction to Voltage Regulators Features of 723 Regulators.

### UNIT II: ACTIVE FILTERS & OSCILLATORS

**Active Filters:** First Order and Second Order Low Pass, High Pass and Band Pass Filters. Active Band Reject and All Pass Filters.
**Oscillators**: Principle of Operation and Types of Oscillators – RC, Wien Bridge and quadrature type. Waveform Generators – Triangular, Saw Tooth, Square Wave.

### UNIT III: 555 TIMER, PLL & CONVERTERS

**Introduction to 555 Timer**: Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger.
**PLL**: Introduction, Block Schematic, Principles and Description of individual Blocks of 565, VCO

**D-A & A- D Converters:** Introduction, Basic DAC Techniques - Weighted Resistor Type, R-2R Ladder Type, Inverted R-2R Type. Different types of ADCs - Parallel Comparator Type, Counter Type, Successive Approximation Register Type and Dual Slope Type, DAC/ADC Specifications.

### UNIT IV: DIGITAL INTEGRATED CIRCUITS INTRODUCTION

Classification of Integrated Circuits, Standard TTL NAND Gate-Analysis & Characteristics, TTL Open Collector Outputs, Tristate TTL, MOS & CMOS Open Drain and Tristate outputs, Comparison of Various Logic Families. IC interfacing- TTL driving CMOS & CMOS driving TTL.

### UNIT V: COMBINATIONAL & SEQUENTIAL CIRCUIT ICs

**Combinational Circuit ICs**: Use of TTL-74XX Series & CMOS 40XX Series ICs, TTL ICs - Code Converters, Decoders, Demultiplexers, Encoders, Priority Encoders, Multiplexers & their

applications. Priority Generators, Arithmetic Circuit ICs-Parallel Binary Adder/Subtractor Using 2's Complement System, Magnitude Comparator Circuits.
**Sequential Circuit ICs:** Commonly Available 74XX & CMOS 40XX Series ICs - RS, JK.JK Master-Slave, D and T Type Flip-Flops & their Conversions, Synchronous and Asynchronous Counters, Decade Counters, Shift Registers & Applications.

**TEXT BOOKS:**
1. Linear Integrated Circuits - *D. Roy Choudhury*, New Age International (p)Ltd, 3" Ed., 2008.
2. Digital Fundamentals - *Floyd and Jain*, Pearson Education,8th Edition, 2005.
3. Op-Amps and Linear Integrated Circuits - Concepts and Applications - *James M.Fiore*, Cengage/ Jaicc, 2/e, 2009.

**REFERENCE BOOKS:**
1. Modern Digital Electronics - *RP Jain* - 4/e - TMH, 2010.
2. Op-Amps & Linear ICs - *Ramakanth A. Gayakwad*, PHI, 1987.

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

- Design various applications of Op-Amps.
- Design the circuits using special ICs like 555 timer, 723 voltage regulator and 565 PLL.
- Design A/D and D/A Converters using ICs.
- Design digital circuits using digital ICs.
- Understanding of the different families of digital integrated circuits and their characteristics.

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## (A56017) PRINCIPLES OF COMPUTER NETWORKS

**(Professional Elective – III)**

**Pre-requisites:** Basic knowledge of computer terminals and numbering system

**Course Objectives:**

1. Compare OSI & TCP/IP models.
2. Understand error detection, correction codes and Noisy, Noiseless Channel Protocols.
3. Outline the concepts of logical addressing.
4. Compare the TCP and UDP Protocols.
5. Explain the application layer protocols.

**UNIT I: Physical Layer**: INTRODUCTION: Data Communications, Network Models, Layered tasks, The OSI MODEL, Layers in the OSI model, TCP/IP protocol suite, Addressing.

**UNIT II**: **Data Link Layer**: Error **Detection and Correction**-Introduction-Types of errors, Redundancy, Detection Versus Correction, Block coding-Error detection ,Error correction. Data Link Control –Framing, Flow and Error Control, Protocols, Noiseless Channels-Simplest, stop and wait, Noisy Channels-Stop-and-wait ARQ, Go-back-N ARQ, Selective Repeat ARQ..

**UNIT III**: **Network Layer**: Logical Addressing, IPV4 Addresses-address space, notation, classful addressing, classless addressing, Network Address Translation (NAT). Internetworking,IPV4-Datagram,Fragmentation,Checksum,Options. **Routing algorithms**- distance vector routing, Path – vector routing Broad casting, Flooding.

**UNIT IV**: **Transport Layer** : Process-to- Process Delivery ,UDP,TCP, Congestion Control-Data Traffic, Congestion, Congestion Control-Open-loop, closed-loop.

**UNIT V**: **Application Layer:** Domain Name space-Name space, Domain Name Space Distribution of name space, Resolution, Electronic mail, WWW-Architecture, HTTP.

**TEXT BOOKS:**

1.Data Communications and Networking - *Behrouz A Forouzan* , 4th Edition, McGraw-Hill.

**REFERENCE BOOKS**:

1. Computer Networks - *Andrew S. Tanenbaum*, Third Edition.
2. Data Communications - *William Stallings*, Eight Editions. Pearson Publishers.

**Course Outcomes:**

1. Analyze TCP/IP and OSI models and various protocols.
2. Identify suitable channel protocols for data transmission.
3. Compare and contrast ipv4 and ipv6.
4. Compare and contrast TCP and UDP Protocols.

5. Remember the Application layer protocols.

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**(A56018) MATERIALS IN ELECTRICAL SYSTEMS**

**(Professional Elective – III)**

**Prerequisite: Physics**
**Course Objectives:**

1. To get a knowledge about engineering materials
2. To learn the different compounds of engineering materials
3. To apply the suitable material for different engineering applications and processes
4. To design the parameters for particular engineering application

**UNIT - I:**

Materials- Conductors-free electron theory and electron scattering Dielectrics-Polarization, solid, liquid and gas dielectrics Insulators-Classification, Application in electric devices.

**UNIT – II:**

Magnetic materials-classification based on orientation of magnetic dipoles, Optoelectronic materials, Semiconductors-simple and compound, Refractory Materials. Solders and contacts, Superconductivity and super conducting materials.

**UNIT - III:**

Components- Resistors and Capacitors. Display units:-LED, LCD and Monitors. Effect of environment on components.

**UNIT - IV:**

Processes- Basic processes used in the manufacture of integrated circuits such as Epitaxy, masking, photolithography, diffusion, oxidation, Etching, metallization, Scribing, wire bonding and Encapsulation. Induction and Dielectric heating. Electron beam welding and cutting.

**UNIT - V:**

Cables- Calculations of capacity of cables, charging current, stress, grading, heating of cables, Construction and characteristics of HV & EHV cable

**TEXT BOOKS:**

1. Electrical Engineering Materials - *Decker*, PHI.

2. Principles of Electrical Engineering Materials - *S.O. Kasap*, TMGH.

**REFERENCE BOOKS:**


1. Principles of growth and processing of semiconductors - *Mahajan*, T MGH.
2. Electronic components and Materials Principles manufacturing and Maintenance - *Dhir*, TMH.
3. Electronic Engineering Materials and Devices - *Allison*, TMH.
4. Microelectronic processing – an introduction to the manufacture of integrated circuits - *Ruska N Scot*, TMGH.


**Course Outcomes:**

After completion of this course student will be able to

1. Evaluate insulating, conducting and magnetic materials used in electrical machines
2. Understand the properties of liquid, gaseous and solid insulating materials
3. Evaluate transformer oil by testing
4. Inspect and test electrical and electronic engineering materials.

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## (A56019) HIGH VOLTAGE ENGINEERING

**(Professional Elective – IV)**

**Prerequisite: Power Systems-I & II**

**Course Objectives:**

1. To get the knowledge of dielectric materials.
2. Deals with Various Dielectric Materials, Numerical methods for electric field computation and Applications.
3. To learn the over voltage phenomena and insulation co-ordination
4. Deals with high voltage testing of materials and electrical apparatus

### UNIT I: INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY AND APPLICATIONS

Electric Field Stresses, Gas / Vaccum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

### UNIT II :BREAK DOWN IN GASEOUS, SOLID AND LIQUID DIELECTRICS

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

### UNIT III : GENERATION AND MEASUREMENTS OF HIGH VOLTAGES AND CURRENTS

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

## UNIT IV: OVER VOLTAGE PHENOMENON AND INSULATION CO-ORDINATION

Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

## UNIT V: NON-DESTRUCTIVE AND HIGH VOLTAGE TESTING OF MATERIAL AND ELECTRICAL APPARATUS

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

## TEXT BOOKS:


1. High Voltage Engineering - *M.S.Naidu and V. Kamaraju* – TMH Publications, 3rd Edition, 2009.
2. High Voltage Engineering: Fundamentals - *E.Kuffel, W.S.Zaengl, J.Kuffel*, Elsevier publications, 2nd Edition, 2000.


## REFERENCE BOOKS:


1. High Voltage Engineering - *C.L.Wadhwa*, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering - *Ravindra Arora, Wolfgang Mosch*, New Age International (P) Limited, 1995.


## Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to

1. To understand Various Dielectric Materials , Numerical methods for electric field computation and Applications.
2. The knowledge gained in this subject helps in High Voltage Testing of Electrical Apparatus and Non Destructive materials.
3. Student can apply knowledge in Measurement of High voltages and currents.
4. To generate AC , DC and Impulse high voltages, currents In real time applications .

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**(A56020) DIGITAL SIGNAL PROCESSING**

**(Professional Elective – IV)**

**Course Objectives :**

The student will be able to

1. Define and use Discrete Fourier Transforms (DFTs)
2. Use Z - transforms and discrete time Fourier transforms to analyze adigital system.
3. Understand simple finite impulse response filters
4. Learn the design procedures used for filter bank
5. Learn to program a DSP processor to filter signals

**UNIT- I: INTRIDUCTION**

Introduction to Digital Signal processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems

**UNIT- II:**

**DISCRETE FOURIER SERIES:** properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT, Relation between Z-transform and DFS

**FAST FOURIER TRANSFORMS:** Fast Fourier transform (FFT)-Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, and FFT for composite N

**UNIT- III: REALIZATION OF DIGITAL FILTERS**

Review of Z-transform, Application of Z-transforms, solution of difference equations of digital filters, Block diagram representation of linear constant coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, system function.

**UNIT- IV:**

**IIR DIGITAL FILTERS:**Analog filter approximations-Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations

**FIR DIGITAL FILTERS:** Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using Window techniques, frequency sampling technique, comparison of IIR&FIR filters.

**MULTIRATE DIGITAL SIGNAL PROCESSING:** Decimation, interpolation, sampling rate conversion, Implementation of sampling rate conversion

**UNIT – V: INTRODUCTION TO DSP PROCESSORS**

Introduction to programmable DSPs:Multiplier and Multiplier Accumulator(MAC),Modified Bus Structures and Memory Access schemes in DSPs multiple access memory, multiport memory,VLSIArchitecture,pipelining,Special addressing Architecture of TMS 320C5X-Introduction,Bus structure, Central Arithmetic Logic unit, Auxiliary registrar, Index Registrar, Auxiliary Register Compare Register, Block Move Address Register parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On-chip registers, On-chip peripherals.

**TEXT BOOKS:**


1.Digital Signal processing, principles, Algorithms, and Applications – *John G.Proakis, Dimitris G. Manolakis,* Pearson Education/PHI,2007
2. Discrete Time signal processing - *A.V Oppenheim and* R.W.*Schaffer*,PHI
3.Digital Signal Processing-Architecture, Programming and Applications - *B.venkataramani, M.Bhaskar*, TATA McGraw Hill,2002


**REFERENCE BOOKS:**


1. Digital Signal Processing - *AndreasAntoniou*, Tata McGraw Hill,2006
2. Digital Signal Processing - *MHHayes*, schaum's Outlines, Tata Mc-Graw Hill,2007
3. DSP Primer - *C.Britton Rorabaugh*,Tata McGraw Hill,2005
4. Fundamentals DSP using Matlab - *Robert J.Schilling*, Sandra L.Harris,Thomson,2007
5. Digital Signal Processing - *Alan V.Oppenheim, RonaldW.Schafer*, PHI Ed.,2006


**Course Outcomes :**

After going through this course the student will be able to

1.Estimate the spectra of signals that are to be processed by a discrete time filter, and to verify the performance of a variety of modern and classical spectrum estimation techniques.
2.Design and simulate a digital filter
3.Design new digital signal processing systems.
4.Design and realize FIR, IIR filters
5.Program a DSP processor to filter signals

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## (A56021) COMPUTER ARCHITECTURE
## (Professional Elective – IV)

**Prerequisite: Digital Logic Design**

**Course Objectives:**

1. Understand instruction format, life cycle and CPU Architecture and Organization
2. Understand different types of I/O interfaces .
3. Familiar with the concepts of pipelining techniques.

**UNIT I:**

Introduction to number system-binary, octal, hexa decimal, other base system, conversion from one number system to other system, range of numbers, addition on number systems,1's and 2's complement and (r-1)'s,r's complement, floating point representation. Logic gates, Boolean algebra, error detecting, error correcting codes

**UNIT II:**

Introduction to Combinational circuits and sequential circuits-RS,JK,D and T flipflops,practical applications of sequential circuits, design of counters, up down counters, definition and practical use of decoders, encoders,Multiplexers,DEMultiplexers.

**UNIT III:**

Multiplication and Division algorithms, Instruction formats-one address, two address, three addresses and zero address instructions, basic computer organizations

**UNIT IV:**

Types of main memory, types of ROM,use of cache memory, calculation of number of address lines and data lines for a given size of memory. Types of REG flag reg,memory hierarchy, auxiliary and content addressable memory, I/O devices

**UNIT V:**

Input-Output Organization, I/O Programming Model, I/O scheme, Peripheral devices, I/O Interface, Asynchronous data transfer modes, Priority Interrupt Direct Memory Access, Input-Output Processor. Introduction to serial communication.

**TEXT BOOKS:**

1. Computer System Architecture - *M. Moris mano*, 3rd edition, person/PHI
2. Computer Organization - *Carl Hamachar, Zvonks Varanasic, SafeaZky*, 5th Edition, McGrawHill

**REFERENCE BOOKS::**

1. Computer Organization and architecture - *William stallings,* 6th edition pearson.
2. Fundamentals logic design - *Roth*,5th edition Thomson.
3. Computer Architecture and Organization -an integrated approach - *Miles Murdocca,Vincent Heuring*, second edition, wiley india.

**Course Outcomes:** Students will be able to

1. Understand the basic organization of computer and different instruction formats and addressing modes.
2. Analyze the concept of pipelining.
3. Understand and analyze various issues related to memory hierarchy.
4. Evaluate various modes of data transfer between CPU and I/O devices.

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**(A56203) POWER ELECTRONICS LAB**

**Prerequisite: Power Electronics**

**Course Objectives:**

1. To understand the basic operation of power electronic switches like SCR,MOSFET and IGBT.
2. To learn the operation of firing circuits to turn on the SCR by R,RC and UJT triggering methods.
3. To know the operation and characteristics of different phase controlled bridge rectifiers.
4. To learn the operation of single phase ac voltage controller, cycloconverter and inverters with resistive and inductive loads.

**PART – A**

1. Study of Volt - Ampere characteristics of SCR,MOSFET & IGBT.
2. Gate firing circuits for SCR.
3. Single phase ac voltage controller with R and RL loads.
4. Single phase half controlled bridge rectifier with R and RL loads with and without freewheeling Diode.
5. Single phase fully controlled bridge rectifier with R and RL loads.
6. Forced commutation circuits (Class A, Class B, Class C, Class D & Class E).
7. DC Jones chopper with R and RL loads.
8. Single phase parallel inverter with R and RL loads.
9. Single phase series inverter with R and RL loads.
10. Single phase Cyclo converter with R and RL loads.

**PART –B**

1. Simulation of single phase full converter using RLE load.
2. Single phase AC voltage controller using RLE load.
3. Simulation of single phase inverter with PWM control.
4. Simulation of 3-ph full converter using RLE load.

Note: Any 8 experiments from part – A and any 2 experiments from part - B.

**REFERENCE BOOKS:**


1. Simulation of Electric and Electronic circuits using PSPICE- *M.H.Rashid*,M/s PHI publications.
2. PSPICE A/D users manual- Microsim, USA.
3. PSPICE Reference guide- Microsim, USA.
4. MATLAB and its Tool Boxes, user manual and Mathworks, USA.
5. PSPICE for power electronics and electric power - *Rashid*, CRC Press


**Course Outcomes:**

After completing this laboratory course the student must demonstrate the knowledge and ability

1. To analyze various Power Electronic switching devices such as SCR, TRIAC, DIAC,MOSFET, IGBT, GTO and phase controlled bridge rectifiers.
2. To understand the various industrial applications of power electronics converters such as single phase ac voltage controller, cyclo converter and inverters.
3. To design the power electronic converter circuits of their own and test in the laboratory.
4. To simulate the various power electronic circuits by using the PSPICE software.

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## (A56204) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

### 1. Introduction

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students' to use good English and perform the following:

- Gather ideas and information, to organize ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

### Course Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

1. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.

**The following course content is prescribed for the Advanced Communication Skills Lab:**

1. **Vocabulary Building** – synonyms and antonyms, Word Roots, One-Word Substitutes, Prefixes and Suffixes, Study of Word Origin, Analogy, Idioms and Phrases.

2. **Reading Comprehension –** Reading for Facts, Guessing meanings from context, Scanning, Skimming, Inferring Meaning, and Critical Reading.
3. **Writing Skills** –Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose.
4. **Technical Writing**- Technical Report Writing, Research Abilities/Data Collection/Organizing Data/Tools/Analysis.
5. **Group Discussion** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Coherence.
6. **Presentation Skills** – Oral presentations (individual and group) through JAM sessions/Seminars, Written Presentations through Projects/ PPTs/e-mails etc.
7. **Interview Skills** – Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Interview through Telephone and Video-Conferencing.

**4.Minimum Requirement**:

The English Language Lab shall have two parts:

i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

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

System Requirement ( Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor
a) Speed – 2.8 GHZ
b) RAM – 512 MB Minimum
c) Hard Disk – 80 GB
ii) Headphones of High quality

**5. Suggested Software:**

The software consisting of the prescribed topics elaborated above should be procured and used.

Suggested Software:

- Clarity Pronunciation Power – part II
- Oxford Advanced Learner‘s Compass, 7th Edition
- DELTA‘s key to the Next Generation TOEFL Test: Advanced Skill Practice.
- TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

The following software from _train2success.com‘

- Preparing for being Interviewed,
- Positive Thinking,
- Interviewing Skills,
- Telephone Skills,
- Time Management
- Team Building,
- Decision making

6. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

**7. Books Recommended:**


1. Technical Communication - *Meenakshi Raman & Sangeeta Sharma*, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual - *Sudha Rani. D*, Pearson Education 2011.
3. English Language Communication : A Reader cum Lab Manual - *Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan*, Anuradha Publications, Chennai 2008.
4. English Vocabulary in Use series, Cambridge University Press 2008.
5. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. Communication Skills - *Leena Sen*, PHI Learning Pvt Ltd., New Delhi, 2009.
7. Handbook for Technical Writing - *David A McMurrey & Joanne Buckely* , CENGAGE Learning 2008.
8. Job Hunting - *Colm Downes*, Cambridge University Press 2008.
9. Master Public Speaking - *Anne Nicholls*, JAICO Publishing House, 2006.
10. English for Technical Communication for Engineering Students - *Aysha Vish hwamohan*, Tata Mc Graw-Hil 2009.
11. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron‘s/DELTA/Cambridge University Press.
12. International English for Call Centres - *Barry Tomalin and Suhashini Thomas*, Macmillan Publishers, 2009.

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## (A56011) LOGICAL REASONING & QUANTITATIVE APTITUDE

**(Mandatory Course)**

**UNIT I :**

**Series Completion :** Number Series, Alphabet Series, Alpha – Numeric Series

**Analogy**: Completing the Analogous Pair, Simple Analogy, Choosing the Analogous Pair, Double Analogy, Word Analogy and Number Analogy. Classification / Odd One Out: Word Classification, Number Classification, Letter Classification.

**Coding – Decoding**: Letter Coding, Number Coding, Matrix Coding, Substitution, Deciphering Message Word Codes, Jumbled coding.

**UNIT II:**

**Blood Relations:** Deciphering Jumbled up Descriptions, Relation Puzzle.

Direction sense test – Number, Ranking & Time Sequence Test – Arithmetical Reasoning– Mathematical Operations.

**Number System :** Test for Divisibility, Test of prime number, Division and Remainder – HCF and LCM of Numbers – Fractions.

**Ratio and Proportion:** Properties of Ratio, Comparison of Ratios, Useful Simple Results on Proportion – Partnership and Share – Mixtures.

**UNIT III:**

**Data Sufficiency**: Problems in which a question on any topic such as Coding – Decoding, Blood Relations, Directions, Arithmetical Reasoning, etc.

**Puzzle Test**: Classification Type Questions, Seating Arrangements Comparison Type Questions, Sequential Order of Things, Selection Based on given conditions, Family – Based Puzzles, Jumbled Problems.

Assertions and Reason – Logical Venn Diagrams – Alpha Numeric Sequence Puzzle. Cubes and Dice – Analytical Reasoning.

**UNIT IV:**

**Logical Deduction:** Logic, Statement – Arguments, Statement – Assumptions, Statement – Conclusions, Deriving Conclusions from Passages.

Clocks & Calendar.

**Simple Interest** : Effect of change of P, R and T on Simple Interest – Compound Interest: Conversion Period, Difference between Compound Interest and Simple Interest – Time and Work – Time and Distance.

**UNIT V: Mensuration:** Area of Plane Figures, Volume and Surface Area of solid figures.

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

**TEXT BOOKS:**

1. Verbal and Non Verbal Reasoning - *R.S.Agarwal*.
2. Quantitative Aptitude - *R.S.Agarwal*.
3. Quantitative Aptitude - *Abhijit Guha*.

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## (A57013) UTILIZATION OF ELECTRICAL ENERGY

**Prerequisite : Engineering Physics, Electrical Machines**

**Course Objectives:**

1. To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading conditions.
2. To acquaint with the different types of heating and welding techniques.
3. To study the basic principles of illumination and its measurement and to understand different types of lightning system including design.
4. To understand the basic principle of electric traction including speed–time curves of different traction services.

### UNIT – I: ELECTRIC DRIVES

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, types of industrial loads, continuous, intermittent and variable loads, load equalization, applications of electric drives.

### UNIT – II : ELECTRIC HEATING & WELDING

Advantages and methods of electric heating, Resistance heating ,Induction heating and Dielectric heating.

Electric welding, Resistance and Arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

### UNIT – III : ILLUMINATION FUNDAMENTALS & VARIOUS ILLUMINATION METHODS

Introduction, terms used in illumination, laws of illumination, polar curves, Discharge lamps, MV , SV and LED lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of interior lighting and flood lighting.

### UNIT – IV: ELECTRIC TRACTION – I

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking, plugging, rheostatic braking and regenerative braking.

Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

**UNIT – V: ELECTRIC TRACTION-II**

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation, adhesive weight and coefficient of adhesion.

**TEXT BOOKS:**


1. Utilization of Electric Energy – *E. Openshaw Taylor*, Orient Longman Private Limited, 1971.
2. Art & Science of Utilization of electrical Energy – *Partab*, Dhanpat Rai & Sons, 2nd edition, 1986.


**REFERENCE BOOKS:**


1. Generation, Distribution and Utilization of electrical Energy – *C.L.Wadhwa*, New Age International (P) Limited, Publishers, 1997.
2. Utilization of Electrical Power including Electric drives and Electric traction – *N.V.Suryanarayana*, New Age International (P) Limited, Publishers, 1996.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. After completion of the course, the student will be able to choose a right drive for a particular application and able to design suitable schemes for welding, heating, drives, illumination and traction.
2. Learn the mathematical aspects involved in various fields like illumination and able to design Illumination systems for various applications.
3. Identifying and troubleshooting the various applications of electrical equipments and Maintain various domestic electrical appliances.
4. Able to determine the speed/time characteristics of different types of traction motors and estimate energy consumption levels at various modes of operation.

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## (A57014) COMPUTER METHODS IN POWER SYSTEMS

**Prerequisite : Network theory, Power systems - II**

**Course Objectives:**

1. To gives idea for the formation of Z-bus , Y-bus by different methods.
2. To provide comprehensive coverage of the power flow solution of an interconnected system using Gauss-Seidal method during normal operation
3. To introduce Iterative techniques like NR and Fast Decoupled method for solving Non linear power flow equations
4. To study fault analysis and steady state ,transient stability analysis

### UNIT-I : POWER SYSTEM NETWORK MATRICES

**Graph theory**: Definitions, Bus incidence Matrix, $Y_{bus}$ formation by direct and singular transformation methods, Numerical Problems.

**Formation of $Z_{bus}$**: Partial network, algorithm for the modification of $Z_{bus}$ for addition element for the following cases: addition of element from a new bus to reference, addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses. Modification of Zbus for the changes in network (problems).

### UNIT –II : POWER FLOW STUDIES

**Necessity of power flow studies- data for power flow studies**- derivation of static load flow equations- load flow solution using Gauss seidel Method: Acceleration Factor, load flow solution with and without P-V buses, Algorithm and Flowchart, Numerical load flow Solution for Simple Power systems (Max 3- buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample one iteration only) and finding line flows and losses for the given Bus Voltages.

**Newton Raphson Method in Rectangular and Polar Co-ordinates form**: Load flow solution with or without PV busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods

### UNIT-III : SHORT CIRCUIT ANALYSIS

Per unit system representation. Per unit equivalent reactance network of three phase Power System, Numerical Problems.

**Symmetrical fault Analysis:** short circuit current and MVA Calculations, Numerical Problems.

**Symmetrical Component Theory:** Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.

Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedances, Numerical Problems.

**UNIT-IV: POWER SYSTEM STEADY STATE STABILITY ANALYSIS**

Elementary concepts of Steady State, Dynamic and Transient Stabilities.

Description of Steady State Stability Power limit, Transfer Reactance, Synchronizing Power Coefficient, Power angle curve and determination of steady state stability and methods to improve steady state stability.

**UNIT-V : POWER SYSTEM TRANSIENT STATE STABILITY ANALYSIS**

Derivation of Swing Equation, Determination of Transient Stability by Equal Area Criterion. Application of EAC, Critical Clearing Angle calculation. Solution of swing equation, Point by point method, Methods to improve stability.

**TEXT BOOKS:**


1. Modern Power System Analysis- *I.J.Nagrath and D.P.Kothari*, Tata McGraw-Hill Publishing Company, 2nd edition, 2003.
2. Computer Techniques in Power System Analysis - *M.A.Pai*, TMH Publications, 2nd edition, 2006.


**REFERENCE BOOKS:**


1. Computer Methods in Power System Analysis - *G.W. Stagg & A.H. El-Abiad*, International Student Edition, 1968.
2. Power System Analysis - *Grainger and Stevenson*, Tata McGraw-Hill Publishing Company,1st Edition , 2003.
3. Power System Analysis - *Hadi Saadat*, Tata McGraw-Hill Publishing Company, 2nd Edition, 2002.
4. Power System Analysis & Design - *B.R. Gupta*, Wheeler Publications, 3rd Edition, 2003.
5. Electrical Power Systems - *C.L. Wadwa* - New Age International (P) Ltd, 6th edition,2006.


**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability

1. An ability to form different network matrices.
2. Provides opportunity to understand different load flow study methods.
3. An understanding of different faults and their study.
4. Ability to conduct analysis of power system for Transient stability and steady state stability.

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## (A57015) POWER SEMICONDUCTOR DRIVES

**Prerequisite : Power Electronics, Electrical Machines**

**Course Objectives:**

1. Able to learn DC Drives control by phase controlled converters and choppers.
2. To understand four quadrant operation of DC drives using phase controlled convertors and choppers.
3. To know control of Induction Motors from stator side and rotor side.
4. To gain knowledge about control of Synchronous Motor drive using various Inverters.

### UNIT – I: CONTROL OF DC MOTORS BY SINGLE PHASE CONVERTERS

Four quadrant operation a drive- Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to separately excited D.C motors – continuous current operation, output voltage and current waveforms, Speed and Torque expressions and speed - torque Characteristics- numerical Problems.

### UNIT – II :CONTROL OF DC MOTORS BY THREE PHASE CONVERTERS

Three phase semi and fully controlled converters connected to separately excited d.c motors – output voltage and current waveforms, Speed and Torque expressions, Speed - Torque characteristics – numerical Problems.

### UNIT – III : FOUR QUADRANT OPERATION OF DRIVES & CONTROL OF DC MOTORS BY CHOPPERS

Introduction to phase controlled four quadrant operation – Four quadrant operation of D.C motors by dual converters – Closed loop operation of DC motor in motoring mode (Block Diagram Only).

Single quadrant, two quadrant and four quadrant chopper fed separately excited dc motors – Continuous current operation, Output voltage and current wave forms, Speed and torque expressions, speed - torque characteristics – numerical Problems.

### UNIT – IV: CONTROL OF INDUCTION MOTORS

**From stator side:**

Variable voltage Control of Induction Motor by Ac Voltage Controllers, Waveforms, speed - torque characteristics – V/f control of Induction motors by Voltage source inverter, current source inverter, Speed - torque characteristics and their comparison – PWM control technique used for various converters –numerical problems.

**From rotor side:**

Rotor resistance control – Slip power recovery control – Static Scherbius drive performance, speed - torque characteristics – Static Kramer Drive performance, speed vs torque characteristics, advantages and applications – numerical problems.

## UNIT – V: CONTROL OF SYNCHRONOUS MOTORS

Separate control & self control of synchronous motors, Operation of self controlled synchronous motors by voltage source inverter and current source inverter – Load commutated CSI fed Synchronous Motor Operation, Waveforms, speed - torque characteristics, Applications and Advantages – Numerical Problems.

## TEXT BOOKS:


1. Fundamentals of electric Drives – *G K Dubey*, Narosa publications, 2nd edition, 2002.
2. Power Electronics – *MD Singh and K B Khanchandani*, Tata – McGraw-Hill Publishing company,1998
3. Principles of electrical machines & power electronics - *PC Sen*, John Wiley & Sons, 2nd edition, 1997.


## REFERENCE BOOKS:


1. Power Electronics Circuits, Devices and applications - *M.H.Rashid*, Pearson Education - Third Edition – First Indian reprint 2004.
2. Modern Power Electronic and AC Drives - *B.K.Bose*, Pearson Publications - 1st edition
3. Thyristor Control of Electric drives – *Vedam Subramanyam*, Tata McGraw Hill Publilcations, 1987.
4. A First course on Electrical Drives – *S K Pillai*, New Age International (P) Ltd. 2nd Editon, 2009.


## Course Outcomes:

After the completion of this course students will be to

1. Understood about phase controlled DC drives and chopper DC drives.
2. Known the operation of DC drives in all four quadrants using phase and chopper controls.
3. Understood the speed control of Induction Motor from stator and rotor side.
4. Gained the knowledge to control Synchronous Motor drive using VSI and CSI etc.

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## (A57016) HVDC TRANSMISSION
## (Professional Elective – V)

**Prerequisite : Power Electronics, power systems – I, Power systems - II**

**Course Objectives:**

1. To learn the importance of HVDC transmission and to analyze HVDC converters
2. To know the reactive power control in HVDC transmission system.
3. To know the faults and protections required in HVDC system
4. To get idea of harmonics and Filters

**UNIT – I : BASIC CONCEPTS**

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C Transmission.

**UNIT – II : ANALYSIS OF HVDC CONVERTERS, CONVERTER CONTROL**

Choice of Converter configuration – Analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star –star mode – their performance**.**

Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control

**UNIT-III : REACTIVE POWER CONTROL IN HVDC, POWER FLOW ANALYSIS**

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies-sources of reactive power-AC Filters – shunt capacitors-synchronous condensers. Modeling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC load flow

**UNIT-IV : CONVERTER FAULT & PROTECTION**

Converter faults – protection against over current and over voltage in converter station – surge arresters – smoothing reactors – DC breakers –Audible noise-space charge field-corona effects on DC lines-Radio interference.

**UNIT –V : HARMONICS & FILTERS**

Generation of Harmonics – Characteristics harmonics, calculation of AC Harmonics, Non-Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics

Types of AC filters ,Design of Single tuned filters –Design of High pass filters.

**TEXT BOOKS:**

1. HVDC Transmission – *S. Kamakshaiah and V. Kamaraju* – TMH – 2011.
2. EHVAC and HVDC Transmission Engineering and Practice – *S.Rao*, Khanna Publishers, 1990.

**REFERENCE BOOKS:**

1. HVDC Transmission – *J.Arrillaga*, IEE, 2nd Edition, 1998.
2. Direct Current Transmission – *E.W.Kimbark*, Volume I, John Wiley & Sons, 1971.
3. Power Transmission by Direct Current – *E.Uhlmann*, B.S.Publications
4. HVDC Power Transmission Systems: Technology and system Interactions – *K.R.Padiyar*, New Age International (P) Limited, 1990.

**Course Outcomes**:

After completing this course the student must demonstrate the knowledge and ability to

1. Describe the advantages of HVDC system
2. Analyze the characteristics of converters and inverters used in HVDC transmission.
3. Apply the knowledge of reactive power control and power factor improvement in real time problems.
4. Design filters such as AC filers, single tuned filters and High pass filters

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## (A57017) FLEXIBLE AC TRANSMISSION SYSTEMS
## (Professional Elective – V)

**Prerequisite : Power Electronics, HVDC transmission, Computer Methods in Power Systems**

**Course Objectives:**

1. Understand the importance of controllable parameters and benefits of FACTS controllers.
2. Know the significance of shunt, series compensation and role of FACTS devices on system control.
3. Analyze the functional operation and control of GCSC, TSSC and TCSC.

### UNIT-I: FACTS CONCEPTS

Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

### UNIT-II: VOLTAGE SOURCE CONVERTERS

Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

### UNIT-III: STATIC SHUNT COMPENSATION

Objectives of shunt compensation, mid-point voltage regulation voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable VAR generation, variable impedance type static VAR generators, switching converter type VAR generators hybrid VAR generators.

### UNIT-IV: SVC AND STATCOM

The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping ,operating point control and summary of compensator control.

### UNIT-V: STATIC SERIES COMPENSATORS

Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, and functional requirements of GTO thyristor controlled series capacitor (GSC),

thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC), Control schemes for GSC ,TSSC and TCSC.

**TEXT BOOKS:**

1. Concepts and Technology of Flexible AC Transmission Systems - Understanding FACTS: *Narain G. Hingorani, Laszlo Gyugyi* - Standard Publishers Distributors - IEEE Press – First Edition – 2001.

**REFERENCE BOOKS:**

1. Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press Series on Power Engineering - *R. Mohan Mathur, Rajiv K. Varma*, 2002.

2. Flexible AC Transmission Systems- *Yong Hua Song, Allan T Johns,* Published by The Institute of Electrical Engineers, 1999, London, UK.

**Course Outcomes:**

After completing this course students will be able to

1. Select an appropriate FACTS device for a particular application. **Identify** the needs of power systems and utility networks where installation of FACTS Controllers/Devices becomes essential.

2. Comprehend the operating principles, control systems and modeling of different FACTS Controllers.

3. Apply the techniques of FACTS controller design for enhancing power transfer, increasing stability, augmenting system damping, mitigating sub-synchronous resonances, preventing voltage instability, performing load compensation, etc.

4. Plan the placement of FACTS Devices in the utility networks.

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## (A57018) ADVANCED POWER ELECTRONICS
## (Professional Elective – V)

**Prerequisite : Power Electronics, Power semi conductor drives, Utilization of Electrical Energy**

**Course Objectives :**

1. To understand the characteristics and principle of operation of modern power semi conductor devices.
2. To comprehend the concepts of different power converters and their applications.
3. To analyze and design switched mode regulator for various applications.
4. To describe the importance of AC voltage controllers and various converters for various industrial applications

### UNIT - I: MODERN POWER SEMICONDUCTOR DEVICES

Modern power semiconductor devices – MOS turn Off Thyristor (MTO) – Emitter Turn off Thyristor (ETO) – Intergrated Gate-Commutated thyristor (IGCTs) – MOS-controlled thyristors (MCTs) – Static Induction circuit – comparison of their features.

### UNIT - II: D.C. TO D.C. CONVERTER

Classification of choppers. Principle of operation, steady state analysis of class A chopper, step up chopper, switching mode regulators: Buck, Boost, Buck-Boost, Cuk regulators. Current commutated and voltage commutated chopper.

Power Supplies: Switched mode D.C. and A.C. power supplies. Resonant D.C and A.C. power supplies.

### UNIT - III: A.C. TO A.C. CONVERTER

Classification, principle of operation of step up and step down cycloconverter. Single phase to single phase cycloconverter with resistive and inductive load. Three phase to single phase cyclo converter: Half wave and full wave. Cosine wave crossing technique. Three phase to three phase cyclo converter. Output voltage equation of cyclo converter.

### UNIT - IV: D.C. TO A.C. CONVERTER

Classification, basic series and improved series inverter, parallel inverter, single phase voltage source inverter, steady state analysis, Half bridge and full bridge inverter: Modified Mc Murray and Modified Mc Murray Bedford inverter, voltage control in single phase inverters, PWM inverter, reduction of harmonics, current source inverter, three phase bridge inverter.

**UNIT - V: APPLICATIONS**

Dielectric and induction heating. Block diagram of D.C. and A.C. motor speed control.

**TEXT BOOKS:**

1. Power Electronics : Circuits, devices and applications - *M.H. Rashid*- PHI.
2. Power Electronics : Converters, Applications and Design - *Ned Mohan, Tore M. Undeland, William P. Robbins* - John Wiley & Sons.

**REFERENCE BOOKS:**

1. Power Electronics - *P.S. Bimbhra,* Khanna Publishers.
2. An Introduction to Thyristors and their applications - *M. Ramamoorthy* -East-West Press.
3. Power Electronics- *M.D. Singh and K.B. Khanchandani*, Tata McGraw-Hill.
4. Power Electronics and Introduction to Drives - *A.K. Gupta & L.P. Singh* -Dhanpat Rai Publishers
5. Power Electronics: Principles & Application- *Jacob, Michael* -Vikas Publishing House

**Course Outcomes:**

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

1. Choose appropriate device for a particular converter topology.
2. Understand the operating principles and models of different types of power electronic converters including dc-dc converters, AC to AC converters and inverters
3. Analyze various converter topologies and can identify the corresponding T.H.D.
4. Apply the knowledge of various devices and converter topologies for different industrial applications.

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**(A57019) EHVAC TRANSMISSION**

**(Professional Elective -VI)**

**Prerequisite : Power Systems – II, High Voltage Engineering, Switch Gear and Protection**

**Course Objectives:**

1. To identify the different aspects of Extra High Voltage A.C and D.C Transmission design and Analysis
2. To get the knowledge of operating conditions of EHV lines.
3. To understand the importance of modern developments of E.H.V and U.H.V transmission systems.
4. To demonstrate EHV ac transmission system components, protection and insulation level for over voltages.

## UNIT – I: PRELIMINARIES

Necessity of EHV AC transmission – advantages and problems–power handling capacity and line losses- mechanical considerations — bundle conductor systems.
Line inductance and capacitances – sequence inductances and capacitances – modes of propagation.

## UNIT – II: VOLTAGE GRADIENTS OF CONDUCTORS

Electrostatics – field of sphere gap – field of line changes and properties – charge – potential relations for multi-conductors – surface voltage gradient on conductors – distribution of voltage gradient on sub-conductors of bundle – Examples.

## UNIT – III: CORONA EFFECTS

Corona in E.H.V. lines – Corona loss formulae- attention of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – frequency spectrum of RI fields – Measurements of RI and RIV.

## UNIT – IV: ELECTRO STATIC FIELD

Electrostatic field: calculation of electrostatic field of EHV/AC lines – effect on humans, animals and plants – electrostatic induction in un-energized circuit of double-circuit line – electromagnetic interference-Examples. Traveling wave expression and solution- source of excitation- terminal conditions- open circuited and short-circuited end- reflection and refraction coefficients-Lumped parameters of distributed lines-generalized constants-No load voltage conditions and charging current.

**UNIT –V: VOLTAGE CONTROL**

Power circle diagram and its use – voltage control using synchronous condensers – cascade connection of shunt and series compensation – sub synchronous resonance in series capacitor – compensated lines – static VAR compensating system.

**TEXT BOOKS:**

1. EHVAC Transmission Engineering - *R. D. Begamudre*, New Age International (p) Ltd, 3rd Edition, 2006.
2. HVAC and DC Transmission - *S. Rao.*

**REFERENCE BOOKS :**

1. EHV Transmission line - Electric Institution - *Edison* (GEC 1968).

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Understand AC and DC transmission system with all aspects
2. Evaluate the latest trends in modern transmission systems.
3. perform in depth converter analysis, faults, protections, harmonic considerations, grounding system
4. work and analyze modern and classical EHVAC systems

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## (A57020) ELECTRICAL DISTRIBUTION SYSTEM
## (Professional Elective-VI)

**Prerequisite : Power systems –I, Power Systems – II, Switch Gear and Protection**

**Course Objectives:**

1. Explain the principles of design and operation of electric distribution feeders.
2. Apply analytic techniques pertaining to primary distribution systems.
3. Use basic design principles for distribution substations and facilities.
4. To learn power factor improvement and to learn voltage control methods

**UNIT – I:**

**GENERAL CONCEPTS :** Introduction to distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor, loss factor - Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

**DISTRIBUTION FEEDERS :** Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

**UNIT – II:**

**SUBSTATIONS :** Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

**SYSTEM ANALYSIS :** Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

**UNIT – III:**

**PROTECTION :** Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers.

**COORDINATION :**Coordination of Protective Devices: General coordination procedure.

**UNIT – IV: COMPENSATION FOR POWER FACTOR IMPROVEMENT**

Capacitive compensation for power-factor control. Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation - Economic justification - Procedure to Determine the best capacitor location.

**UNIT – V: VOLTAGE CONTROL**

Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop Compensation.

**TEXT BOOKS:**

1. Electric Power Distribution system, Engineering – *Turan Gonen*, Mc Graw-hill Book Company, 1986.
2. Electric Power Distribution – *A.S. Pabla*, Tata Mc Graw-hill Publishing company, 4th edition, 1997.

**REFERENCE BOOKS:**

1. Electrical Power Distribution and Automation - *S.Sivanagaraju, V.Sankar*, Dhanpat Rai & Co, 2006
2. Electrical Power Distribution Systems - *V.Kamaraju*, Tata McGraw-Hill Education, 2009.

**Course Outcomes:**

This course will enable the students

1. To understand the objectives of Distribution system protection and Coordination of protective devices
2. Able to analyze substations and benefits derived through optimal location of substations.
3. Able to calculate Voltage drop and power – loss and manual methods of solution for radial networks
4. Able to apply the knowledge on distribution systems, Load Modelling and Characteristics.

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**(A57021) POWER SYSTEM RELIABILITY**

**(Professional Elective-VI)**

**Prerequisite : None**

**Course Objectives:**

- Understand the concept of probability theory, distribution, network modeling and reliability analysis.
- Describe the reliability functions with their relationships and Markov modeling.
- Evaluate reliability models using frequency and duration techniques and generate various reliability models.
- Explicate the reliability of composite systems and distribution systems

## UNIT – I : BASICS OF PROBABILITY THEORY & DISTRIBUTION

Basic probability theory – rules for combining probabilities of events – Bernoulli's trials – probabilities density and distribution functions – binomial distribution – expected value and standard deviation of binomial distribution.

## UNIT – II:NETWORK MODELING AND RELIABILITY ANALYSIS

**NETWORK MODELING :** Analysis of Series, Parallel, Series-Parallel networks – complex networks – decomposition method.

**RELIABILITY FUNCTIONS:** Reliability functions f(t), F(t), R(t), h(t) and their relationships – exponential distribution – Expected value and standard deviation of exponential distribution – Bath tub curve – reliability analysis of series parallel networks using exponential distribution – reliability measures MTTF, MTTR, MTBF.

## UNIT – III : MARKOV MODELING

Markov chains – concept of stochastic transitional probability Matrix, Evaluation of limiting state Probabilities. – Markov processes one component repairable system – time dependent probability evaluation using Laplace transform approach – evaluation of limiting state probabilities using STPM – two component repairable models.

**UNIT – IV:FREQUENCY & DURATION TECHNIQUES**

Frequency and duration concept – Evaluation of frequency of encountering state, mean cycle-time, for one , two component repairable models – evaluation of cumulative probability and cumulative frequency of encountering of merged states.

**UNIT – V : GENERATION SYSTEM RELIABILITY ANALYSIS**

Reliability model of a generation system– recursive relation for unit addition and removal – load modeling - Merging of generation load model – evaluation of transition rates for merged state model – cumulative Probability, cumulative frequency of failure evaluation – LOLP, LOLE.

**TEXT BOOKS:**


1. Reliability Evaluation of Engg. System – *R. Billinton, R.N.Allan*, Plenum Press, New York, reprinted in India by B.S.Publications, 2007.
2. Reliability Evaluation of Power systems – *R. Billinton, R.N.Allan*, Pitman Advance Publishing Program, New York, reprinted in India - B.S.Publications, 2007.


**Course Outcomes:**

After completion of this course students will be able to

1. The student shall have a thorough understanding of the main principles in power system reliability analysis as well as knowledge of different methods and tools for reliability analysis.
2. The student shall be able to model and analyze electric power systems with respect to reliability of supply.
3. Understand the application of basic probability theory and distribution to power systems.
4. Apply techniques for reliability evaluation of individual systems and of composite systems.

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**(A57022) VLSI SYSTEM DESIGN**

**(Open Elective-I)**

**Prerequisite: EDC**

**Course objectives:**

1. Give exposure to different steps involved in the fabrication of ICs using MOS transistor,CMOS/BICMOS transistors and passive components
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
5. Provide design concepts to design building blocks of data path of any system using gates.
6. Understand basic programmable logic devices and testing of CMOS circuits.

**UNIT- I- INTRODUCTION:** Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS Technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and Capacitors, CMOS Nanotechnology.

**BASIC ELECTRICAL PROPERTIES :** Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, $g_m$, $g_{ds}$, figure of merit $\omega o$; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, BiCMOS Inverters.

**UNIT- II: VLSI CIRCUIT DESIGN PROCESSES**
VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

**UNIT- III:**
**GATE LEVEL DESIGN :** Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers.

**DATA PATH SUBSYSTEMS:** Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

**UNIT- IV:**

**ARRAY SUBSYSTEMS:** SRAM, DRAM, ROM, Serial Access Memory, Content addressable memory

**SEMICONDUCTOR INTEGRATED CIRCUIT DESIGN:** PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

**UNIT- V : CMOS TESTING**

CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

**TEXT BOOKS:**

1. Essentials of VLSI circuits and systems – *Kamran Eshraghian, Eshraghian Dougles and A.Pucknell,* PHI, 2005 Edition
2. VLSI Design – *K.Lal Kishore,V.S.V.Prabhakar,*I.K Imternational,2009.
3. CMOS VLSI Design – A circuits and systems perspective - *Neil H.E Weste*, David Harris,Ayan Banerjee,pearson,2009.

**REFERENCE BOOKS:**

1. CMOS logic circuit Design- *John P.Uyemura*, Springer, 2007.
2. Modern VLSI Design – *Wayne Wolf*, Pearson Education, 3rd Edition, 1997.
3. VLSI Design-*A. Albert Raj, Latha*, PHI, 2008.
4. Introduction to VLSI-*Mead & Convey*, BS Publications, 2010.
5. VLSI Design-*M.Micheal Vai*, CRC Press, 2009.

**Course Outcomes:**

Upon successfully completing the course, the student should be able to:

1. Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
2. Choose an appropriate inverter depending on specifications required for a circuit.
3. Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit.
4. Design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
5. Provide design concepts required to design building blocks of data path using gates.
6. Design simple memories using MOS transistors and can understand design of large memories.
7. Design simple logic circuit using PLA, PAL, FPGA and CPLD.
8. Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.

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**(A57023) PRINCIPLES OF DATABASE MANAGEMENT SYSTEMS**

**(Open Elective – I)**

**Prerequisite:** Any programming language

**Course Objectives:**

1. To provide a sound introduction to Database management systems, Databases and its applications,
2. To familiarize the participant to give a good formal foundation on the relational model of data
3. To present SQL and procedural interfaces to SQL comprehensively
4. To give an introduction to systematic database design approaches conceptual design, logical design ,schema refinement and physical design
5. To introduce the concepts of transactions and transaction processing and the issues and techniques relating to concurrency and recovery manager.

**UNIT-I**

**INTRODUCTION TO DATABASE SYSTEM CONCEPTS:** Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

**INTRODUCTION TO THE RELATION MODELS AND DATABASE DESIGN USING ER MODEL:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features,

**UNIT-II**

**INTRODUCTION TO SQL:** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions Nested Sub queries, Modification of the Database.

**INTERMEDIATE AND ADVANCED SQL:** Join Expressions, Views , Integrity Constraints, SQL Data Types, Authorization. Functions and Procedures, Triggers, Advanced Aggregation Features.

**UNIT-III**

**FORMAL RELATIONAL QUERY LANGUAGES:** The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus.

**RELATIONAL DATABASE DESIGN:** Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Decomposition Using Multi valued Dependencies, More Normal Forms.

**UNIT-IV**

**INDEXING AND HASHING:** Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

**TRANSACTIONS :** Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels

**UNIT-V:**

**CONCURRENCY CONTROL :** Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multi version schemes.

**RECOVERY SYSTEM:** Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Non-volatile Storage, ARIES, Remote Backup Systems.

**TEXT BOOKS:**


1. Database System Concepts - *Abraham Silberschatz, Henry F. Korth, S. Sudarshan,* 6th Edition, Tata McGraw-Hill.
2. Database Management System - *Raghu Rama Kirshna, Johannes Gehrk,* Tata McGraw Hill 3rd Edition.


**REFERENCE BOOKS:**


1. Database System Concepts - *Peter Rob & Carlos Coronel*, Cengage Learning.
2. Fundamentals of Database Systems - *Ramez Elmasri, Shamkanth B. Navrate* , 7th Edition, Pearson Education.
3. Introduction to Database Systems - *C.J. Date* , Pearson Education


**Course Outcomes:**

1. Design Entity-Relationship Model for enterprise level databases.
2. Develop the database and provide restricted access to different users of database and formulate the Complex SQL queries.
3. Analyze various Relational Formal Query Languages and various Normal forms to carry out Schema refinement
4. Use of suitable Indices and Hashing mechanisms for real time implementation.
5. Ability to analyze various concurrency control protocols and working principles of recovery algorithms.

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**(A57024) DIGITAL COMMUNICATION**

**(Open Elective – I)**

**Course Objectives:**

The student will be able to

1. Understand pulse digital modulation systems such as PCM,DPCMand DM.
2. Understand various digital modulation techniques and able toanalyze various systems for their performance in terms of probability of error.
3. Study the concept of entropy and need for source coding.
4. Study Block codes, cyclic codes and convolution codes and the concept of spread spectrum modulation.

**UNIT –I: ELEMENTS OF DIGITAL COMMUNICATION SYSTEMS**

Model of digital communication systems, Digital representation of analog signal, Certain issues in digital transmissions, Advantages of Digital Communication Systems, Bandwidth-S/N tradeoff, Hartley shanonlaw ,Sampling theorem**.**

**UNIT- II: PULSE CODE MODULATION**

PCM generation and reconstruction, Quantization noise, Non uniform quantization and companding, Differential PCM Systems (DPCM), Delta modulation and it's draw backs, Adaptive DPCM, Adaptive Delta Modulation, Noise in PCM and DM.Digital modulation technique: ASK, ASK modulator, Coherent ASK detector, non Coherent ASK detector,FSK, Band width and frequency spectrum of FSK, Coherent FSK detector, non Coherent FSK detector, FSK detection using PLL, BPSK ,Coherent PSK detection , QPSK, differential PSK.

**UNIT-III: BASE BAND TRANSMISSION AND OPTIMAL RECEPTION OF DIGITAL SIGNAL**

Pulse shaping for optimum transmissions, A base band signal receiver, probability of error, Optimum receiver ,optimal of coherent reception, Signal space representation and probability of error, Eye diagram, cross talk.

**INFORMATION THEORY**

Information and entropy, Conditional entropy and redundancy, Shannon fano coding , mutual information, information loss due to noise, source coding-Huffman code, Variable length coding, Source coding to increase average information for bit, Lossy source coding.

**UNIT-IV: LINEAR BLOCK CODES**

Matrix description of linear block codes, Error detection and correction capabilities of linear block codes.

**CYCLIC CODES :** Algebraic structure and encoding, Syndrome calculation and decoding.

**CONVOLUTION CODES**: Encoding and decoding using state, Trees and trellis diagrams, Decoding using veterbi algorithm, Comparision of error rates in coded and uncoded transmission.

**UNIT-V: SPREAD SPECTRUM MODULATION**

Use of spread spectrum,direct sequence spread spectrum (DSSS),
Code division multiple access & rating uses DSSS division multiple access raging using DSSS frequency Hopping spread spectrum PN sequence generation and characteristics: Generation and characteristics, Synchronization in spread spectrum systems

**TEXT BOOKS:**


1. Principles of communication systems - *Herbert Taub. Donald L Schiling, Goutam Sana*, 3rd Edition,McGraw-Hill, 2008.
2. Digital and Analog Communicator Systems - *Sam Shanmugam*, John Wiley, 2005


**REFERENCE BOOKS:**


1. Digital Communications - *John G. Proakis . Masoudsalehi* – 5th Edition, McGraw-Hill, 2008.
2. Digital Communication - *Simon Haykin*, Jon Wiley, 2005.
3. Digital Communications - *Ian A. Glover, Peter M. Grant*, Pearson Edu., 2008.
4. Communication Systems - *B.P. Lathi*, BS Publication, 2006


**Course Outcomes:**

After going through this course the student will be able to

1. Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
2. Analyze various source coding techniques
3. Compute and Analyze Block codes, cyclic codes and convolution codes.
4. Design a coded communication system.

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## (A57204) MICRO PROCESSORS & MICRO CONTROLLERS LAB

**Note:** Minimum of 12 experiments to be conducted.

**List of Experiments:**

The Following programs/experiments are to be written for assembler and execute the same with 8086 and 8051 kits.

1. Programs for 16 bits arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Programs for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor using 8255.
10. Programming using arithmetic, logic and bit manipulation instructions of 8051/AVR.
11. Program and verify Timer / Counter in 8051.
12. Program and verify Interrupt handling in 8051.
13. UART Operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing Matrix / Keyboard to 8051.
17. Data Transfer from Peripheral to Memory through DMA controller 8237/ 8257.

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## (A57205) ELECTRICAL MEASUREMENTS LAB

**Course Objectives:**

1. To learn testing methods of energy meter and current transformer.
2. To learn measurement of low and medium resistance.
3. To learn the use of ac bridges for L and C measurement.
4. To learn the measurement of power and power factor.

**The following experiments are required to be conducted as compulsory experiments:**

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Measurement of % ratio error and phase angle of given C.T. by comparison.
6. Schering bridge & Anderson bridge.
7. Measurement of 3 phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.

**In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:**

9. Calibration LPF wattmeter using Phantom loading.
10. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
11. Dielectric oil testing using H.T. testing Kit
12. LVDT and capacitance pickup – characteristics and Calibration

**Course Outcomes:**

After completing this course the student must demonstrate the knowledge and ability to

1. Calibrate single phase energy meter
2. Measure Resistance, Inductance and capacitance using AC and DC bridges
3. Determine ratio error and phase errors in CTs and PTs
4. Identify various meter terminologies

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## (A58007) MANAGEMENT SCIENCE
## (Open Elective – II)

**Course Objectives:**

- To provide students a wonderful opportunity of learning the basics and concepts of management functions like Marketing, HRM, Operations Management and an Organization environment.
- To apply major quantitative techniques in order to improve managerial decisions
- To develop analytical, critical thinking, and problem-solving skills in a business context

**UNIT-I**

**INTRODUCTION TO MANAGEMENT: ENTREPRENEURSHIP AND ORGANIZATION:** Nature and importance of Management, Functions of Management, Taylor's scientific Management Theory, Fayol's principles of management, Maslow's theory of Human Needs, Douglas Mc Gregor's Theory X and Theory Y, Herzberg's Two factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social Responsibilities of Management. Types of organization structures.

**UNIT-II**

**OPERATIONS MANAGEMENT:** Principles and Types of Plant Layout-Methods of production(Job, batch and Mass production), Work Study – Basic procedure involved in Method Study and Work measurement-Statistical Quality Control: X chart, R chart, C chart, P chart, (simple problems), Acceptance Sampling, Deming's contribution to quality.

**MATERIALS MANAGEMENT:** Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records – Supply Chain Management.

**UNIT –III**

**HUMAN RESOURCES MANAGEMENT (HRM):** Evolution of HRM, Concepts of HRM, Basic functions of HR Manager: Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

**MARKETING:** Functions of Marketing, Marketing Mix, Marketing strategies based on Product Life cycle, Channels of distribution.

**UNIT –IV: PROJECT MANAGEMENT(PERT/CPM)**

Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method(CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing.(simple Problem)

**UNIT –V :STRATEGIC & CONTEMPORARY MANAGEMENT PRACTICES**
Mission, Goals, objectives, policy, strategy, Programmes, Elements of Corporate Planning process, Environmental Scanning, SWOT analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Basic concepts of Just-In-Time(JIT) system, Total Quality Management(TQM), Six Sigma and Capability Maturity Model(CMM) levels, Value chain Analysis, Enterprise Resource Planning(ERP), Performance Management, Business Process Outsourcing(BPO), Business process Re-engineering 5S Model, Deming's PDCA, Kaizen, Poka-Yoke, Muda, Benchmarking, Balanced Score Card.

**TEXT BOOKS:**


1. Management Science - *Aryasri*, TMH, New Delhi, 2009


**REFERENCE BOOKS:**


1. Management, *Stoner*, Pearson, 2009.
2. Marketing Management - *Kotler Philip & Keller Kevin Lane*, PHI, 2009.
3. Principles of Management - *Koontz, Weihrich & Aryasri*, TMH, 2009.
4. Management-Principles and Guidelines - *Thomas N. Duening & John M. Ivancevich*, Cengage, 2009.
5. Production and Operations Management - *Kanishka Bedi*, Oxford University Press, 2009.
6. Personnel Management - *Memoria & S.V.Ganker*, Himalaya, 2009.
7. Management - *Schermerhorn*, Wiley, 2009
8. Parnell: Strategic Management - *Biztantra*, 2009.
9. PERT/CPM - *L.S. Srinath*, Affiliated East-West Press, 2009.
10. Introduction to Management Science - *William J. Stevenson & Ceyhun Ozgur*, TMH, 2007


**Course Outcomes:**

1. There are varieties of sources in helping you to understand the foundation of decision making.
2. Provide the students with a basic understanding of contract models.
3. be able to prepare contract plans and specifications.
4. be able to prepare quantity take-offs, productivity analyses, cost estimates and schedules for given projects.
5. understand elements of procurement and bidding strategies.

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## (A58008) DISASTER MANAGEMENT
## (Open Elective – II)

**Course objectives** :

As student work through this session he/she will learn to

1. Distinguish between disaster management and risk management
2. Explain selected models of disaster management
3. Describe the strategies for risk mitigation
4. List activities needed for post-disaster management

### UNIT – I: INTRODUCTION

Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

### UNIT – II: DISASTERS

Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

### UNIT – III: DISASTER IMPACTS

Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

### UNIT – IV: DISASTER RISK REDUCTION (DRR)

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

## UNIT – V: DISASTERS, ENVIRONMENT AND DEVELOPMENT

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental-friendly recovery; reconstruction and development methods.

## TEXT BOOKS:


1. Disaster Management - *H.K. Gupta* - University Press, India, 2003.
2. Handbook of Disaster Management: techniques & Guidelines - *Singh B.K., Rajat* Publications, 2008.
3. Disaster Mitigation: Experiences and Reflections - *Pardeep Sahni*
4. Disaster Risk Reduction in South Asia - *Pradeep Sahni* - Prentice Hall, 2004.


## REFERENCE BOOKS:


1. Disaster Management - *Ghosh G.K.,* APH Publishing Corporation, 2006.
2. Environmental Geography - *R.B Singh* - Heritage Publishers, New Delhi, 1990
3. Environmental Geography - *Savinder Singh* - Prayag pustak Bhawan, 1997
4. Disaster Management - *R.R Singh* - Rawat Publication, New Delhi, 2000.
5. The Environment as Hazards - *Kates, B.I & White GF*, oxford, New York, 1978
6. Space Technology for Disaster Mitigation in India (INCED) - *R.R. Singh*, University of Tokyo, 1994
7. Disaster Management in Hills- *Dr. Satender* - Concept publishing co., New Delhi, 2003
8. Action plan For Earthquake, Disaster, Mitigation in Disaster Management - *A.S. Arya , V.K. Sharma* , IIPA publications, New Delhi, 1994
9. An overview on Natural & Man made Disaster & their Reduction - *R.K. Bhandani*, CSIR, New Delhi
10. Manuals on Natural Disaster management in India - *M.C. Gupta*, National Centre for Disaster Management, IIPA, New Delhi, 2001
11. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
12. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).


**Course outcomes:**

After completing this session, student will be able to

1. Affirm the usefulness of integrating management principles in disaster mitigation work
2. Distinguish between the different approaches needed to manage pre- during and post-disaster periods
3. Explain the process of risk management
4. Relate to risk transfer

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**(A58009) PROJECT MANAGEMENT**

**(Open Elective – II)**

**Course objectives:**

1. To lay the foundation to students in managing projects with a special focus on every phase such as project planning, execution, monitoring and evaluation
2. To learn how to identify the projects and planning
3. To learn how to execute the projects
4. To learn how to lead the team and evaluation of projects

**UNIT-I:INTRODUCTION**

Introduction to Project management, Need for Project Management, Project Lifecycle, Project management phases in lifecycle, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, stake holder management, organization culture, creating a culture for project management, Project management principles.

**UNIT-II: PROJECT IDENTIFICATION AND PLANNING**

Project identification process, Defining the project, Approaches to project screening and selection, Project Planning, Work breakdown structure, Financial Module, Getting Approval and compiling a project charter, setting up a monitoring and controlling process

**UNIT-III: PROJECT EXECUTION**

Initiating the project, Controlling and reporting project objectives, Conducting project evaluation, Risk, Role of risk management, Project management, Four Stage process , Risk management an integrated approach, Cost Management, Creating a project Budget

**UNIT-IV : LEADING PROJECT TEAMS**

Building a project Team, Characteristics of an effective project Team, achieving Cross-functional co-operation, Virtual project teams, Conflicts management, Negotiations.

**UNIT-V:PERFORMANCE MEASUREMENT AND EVALUATION**

Monitoring project performances , Project control cycles, Earned value management, Human factors in project Evaluation and control, Project termination, Types of project terminations, project follow-up. Current and future trends in project management.

**REFERENCE BOOKS :**


1. Project Management – *Gray, Larson*, Tata McGraw Hill,2015
2. Project Management- *Jeffery K.Pinto*, Pearson Education,2015
3. Project Management - *Enzo Frigenti, Kogan*, 2015
4. Project Management - *R. Panneerselvam & P. Senthilkumar*, PHI, 2015
5. Financially Focused Project Management - *Thomas M.Cappels*, SPD, 2008.
6. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.


**Course outcomes:**

After completion of this course students will be able to

1. Identify the projects and planning the projects
2. Execute the projects
3. How to lead the team
4. Evaluation of projects

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### (A58010) OBJECT ORIENTED PROGRAMMING AND JAVA
### (Open Elective - III)

**Prerequisite:** Any programming language

**Course Objectives:**

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. Have the ability to write a computer program to solve specified problems.
4. Be able to use the Java SDK environment to create, debug and run simple Java programs.

**UNIT -I :**

Object oriented thinking – need for oop paradigm- Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, coping with complexity, abstraction mechanisms. Java Basic History of Java Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring string class.

**UNIT -II :**

Inheritance – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Packages and Interfaces : Defining, Creating and Accessing a Package, Understanding CLASSPATH importing packages, differences between classes and interfaces, defining an interface, implementing interface applying interfaces, variables in interface and extending interfaces. Exploring java.io.

**UNIT -III:**

Exception handing – Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and

finally, built in exceptions, creating own exception sub classes.String handling, Exploring java.util

Multithreading- Difference between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.Enumerations, autoboxing, annotations, generics.

**UNIT- IV:**

Event Handling : Event, Event sources, Event classes, Event Listeners, Delegation event model, hand ling mouse and keyboard events, adapter classes.

The AWT class hierarchy, user interface components- labels, buttion, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, mnubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

**UNIT -V :**

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

**TEXT BOOKS :**

1. Java; the complete reference - *Herbert schildt* , 7th edition, TMH.
2. Understanding OOP with Java, updated edition - *T. Budd*, pearson eduction.

**REFERENCE BOOKS :**

1. An Introduction to programming and OO design using Java - *J.Nino and F.A. Hosch*, John wiley & sons.
2. An Introduction to OOP - *T.Budd* , third edition, pearson education.
3. Introduction to Java programming - *Y. Daniel Liang*, pearson education

**Course Outcomes:**

1. Understand the model of object oriented programming
2. Analyze the fundamental features of an object oriented language.
3. Apply statement of a business problem and determine suitable logic for solving the problem

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**(A58002) INTELLECTUAL PROPERTY RIGHTS**
**(Open Elective - III)**

**Course Objectives:**

1. To acquire specialized knowledge of law and practice relating to Insurance and trademarks.
2. To apply the appropriate ownership rules to intellectual property you have been involved
3. To get the international overview of intellectual property.
4. Analyse an innovative or creative output in terms of intellectual property rights generated

**UNIT –I: INTRODUCTION TO INTELLECTUAL PROPERTY**

Introduction, types of Intellectual Property, International organization, agencies and treaties, importance of intellectual property rights.

**UNIT II : TRADEMARKS**

Purpose and function of Trademarks, Acquisition of Trademarks Rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT III : LAW OF COPY RIGHTS & PATENTS**

Fundamental of copy rights law, originality of material, rights of reproduction, rights to perform the work publicly, copy right owner ship issues, copy right registration, notice of copy right, international copy right law. Foundation of patent law, patent searching process, owner ship rights & transfer.

**UNIT IV : TRADE SECRETS & UNFAIR COMPETITION**

Trade secret law, determination of trade secrete status, liability for misappropriation right of trade secrets, protection for submission, trade secrete litigation. Misappropriation right of publicity, false advertising.

## UNIT V : NEW DEVELOPMENT & INTERNATIONAL OVERVIEW ON INTELLECTUAL PROPERTY

New developments in trade mark law, copy right law, patent law, and intellectual property audits. International trade mark law, copy right law, international patent law, international development in trade secrets law.

**TEXT BOOKS:**

1. Itellectual property rights - *Deborah. E. bouchoux* , Cengage learning

2. Intellectual Property Rights : Unleashing the knowledge economy - *Prabuddha gangulli*, Tata Mc Graw Hill Publishing Company Ltd.

**Course Outcomes:** After completing this course the student must demonstrate the knowledge and ability to

1. Get a holistic understanding of the complexities involved in the process of attributing intellectual property rights to people.
2. Learn the legalities of intellectual property to avoid plagiarism and other IPR problems.
3. Understand the relevance and impact of IP Law on academic/scientific works/studies.
4. Demonstrate appreciation and critical awareness of pertinent IP issues in the academic and professional lives.

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## (A58011) NANO TECHNOLOGY
## (Open Elective - III)

**Course Objectives:**

1. To get a knowledge on nano science and nano technology
2. Apply key concepts in materials science, chemistry, physics, biology and engineering to the field of nanotechnology.
3. To get an idea over the fabrication of nanomaterials
4. Identify current nanotechnology solutions in design, engineering and manufacturing

**UNIT I : INTRODUCTION**

Evolution of science and technology, Introduction to Nanotechnology, Nanotechnology – Definition – Difference between Nano science and Nanotechnology, Feynman predictions on Nanotechnology, Moores law, Role of Bottom up and top down approaches in nanotechnology, challenges in Nanotechnology.

**UNIT II: NANO MATERIALS**

History of materials, Nano materials – Definition, Classification of Nano structured materials, cause of interest in nanomaterials, some present and future applications of nano materials.

**UNIT III: SYNTHESIS AND PROCESSING OF NANO POWDERS**

Processes for producing ultrafine powders – mechanical milling, wet chemical synthesis, gas condensation process, chemical vapour condensation, laser ablation.

**UNIT IV : SPECIAL NANOMATERIALS, CHARACTERIZATION AND TOOLS**

Carbon nanotubes, nano composites, carbon fullerenes: An overview of preparation, properties applications. Electron Microscopy Techniques: Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Probe Microscopy – X ray methods:

**UNIT V: NANOELECTRONICS**

Introduction to micro, nano fabrication: Optical lithography, Electron beam lithography, Atomic lithography, Molecular beam epitaxy, MEMS:-Introduction, Principles, Types of MEMS:-Mechanical, Thermal, Magnetic MEMS; Fabrication of MEMS.

**TEXT BOOKS:**

1. Nano materials - *A S Edelstein & R C Cammarata*, Institute of physics publishing, Bristc and Philadelphia.

**REFERENCE BOOKS:**


1. Nano materials - *J.Dutta & H.Hofman*.
2. Nano structures & Nano materials - *Guozhong cao*, Imperial college press.
3. Micro manufacturing and Nano Technology - *N.P.Mahalik*.
4. Nano Technology - *Mark Ratner & Danier Ratner*, Prentice Hall.


**Course Outcomes:**

1. Get an idea and importance of nano science and nano technology
2. Apply key concepts in materials science, chemistry, physics, biology and engineering to the field of nanotechnology.
3. Get an idea over the fabrication of nanomaterials
4. Identifies current nanotechnology solutions in design, engineering and manufacturing