ELECTRICAL AND ELECTRONICS ENGINEERING

VII SEMESTER

COURSE CODE	THEORY/LAB	L	T	P	C
AHM1102	Management Science	4	0	0	4
AEE1121	Power System Analysis	4	1	0	4
AEE1122	Power System Operation and Control	4	1	0	4
AEE1132	HVDC Transmission	4	1	0	4
	Elective – I	4	1	0	4
AEE1124	Renewable Energy Sources				
AEE1125	Reliability Evaluation of Engineering Systems				
AEE1126	Neural Networks and Fuzzy Logic				
AEE1140	Electrical Safety Management				
AEE1142	Design Concepts for Engineers				
	Elective – II	4	1	0	4
AEE1127	Programmable Logic Controllers				
ACT1121	Embedded Systems				
AEE1128	Distribution Automation				
AIT1114	Data Structures for Engineering Applications				
AEE1129	Electrical Measurements and Simulation Lab	0	0	3	2
AEE1130	Microcontrollers Lab	0	0	3	2
AEE11MP	Industry Oriented Mini Project*	-	-	-	2
	Total	**24**	**5**	**6**	**30**

* Mini Project to be carried out during the summer vacation after VI Semester examination

* Evaluation at the beginning of the VII Semester

MANAGEMENT SCIENCE

Course Code: AHM 1102

L	T	P	C
4	0	0	4

AIM :

To familiarize with the process of management and to provide basic insights to select contemporary management practices.

OBJECTIVE :

To understand the management processes and evolve management levels for effective decision making

UNIT-I

INTRODUCTION TO MANAGEMENT : Concepts of Management and Organization – Nature, Importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne experiments, Maslow's Theory of human needs, Douglas Mc Gregor's Theory X and Theory Y, Hertzberg's Two factor Theory of motivation, Systems approach to Management, Leadership styles

UNIT-II

DESIGNING ORGANIZATIONAL STRUCTURES : Basic concepts related to Organization, Departmentation and Decentralization, Types of Mechanistic and Organic Structure of Organization (Line Organization, Line and staff Organization, Functional Organization, Committee Organization, Matrix Organization, Virtual Organization, Cellular Organization, Team Structure, Boundary less Organization, Inverted Pyramid Structure, Lean and Flat Organization Structure) and their merits, demerits and suitability

UNIT-III

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: R chart, P chart, C chart (Simple numerical problems)

UNIT-IV

MATERIALS MANAGEMENT :

Objectives, Need for Inventory control, EOQ, ABC & VED Analysis, Purchase Procedure, Stores Management and Stores Records (simple numerical problems)Just in Time System (JIT)

UNIT-V

MARKETING MANAGEMENT : Functions of Marketing, Marketing mix, marketing strategies based on product life cycle, Channels of distribution, Consumer behavior and Customer relationship management

UNIT-VI

HUMAN RESOURCES MANAGEMENT : Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic functions of HR Manager : Manpower planning, Recruitment, Selection, Training and Development, Placement, Performance Appraisal, Job Evaluation and Merit Rating Grievance handling and Welfare Administration

Introduction to Social Security Laws: Payment of Gratuity Act (1972), Employees Provident Fund & Miscellaneous Provisions Act (1958), Employees State Insurance Act (1948)

UNIT-VII

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 numerical problems)

UNIT-VIII

STRATEGIC MANAGEMENT : Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Steps in strategy formulation and implementation,

value Chain Analysis, SWOT Analysis

Corporate social responsibility, business ethics and corporate governance

TEXT BOOKS :

1. A R Aryasri, Management Science, Tata McGraw Hill, 2/e, 2007
2. O P Khanna, Industrial Engineering and Management, Dhanpat Rai Publishers, 2/e,2007

REFERENCE BOOKS :

1. Azhar Kazmi: Business Policy and Strategic Management, Tata McGraw Hill, 3rd Edition, 2008.
2. S D Sharma : Operations Research, Kedarnath Ramnath& Co
3. Philip Kotler & Keller : Marketing Management, Pearson Education, 13th Education, 2008.
4. C B Mamoria & C B Mamoria : Personnel Management, Himalaya Publishers, 12th Edition, 1996.
5. B S Goel: Production and Operations Management, Pragati Prakasan, 2nd Edition, 1979.
6. Strategic Management: R Srinivasan, Eastern Economy Edition, PHI, 3rd Edition, 2008.
7. L M Prasad: Principles and Practice of Management, Sultan Chand & Sons, 7th Edition, 2008.

POWER SYSTEM ANALYSIS

Course Code: AEE1121

L	T	P	C
4	1	0	4

AIM & OBJECTIVE:

Students get trained in Modeling concepts, network calculations and Load flow methods. Students will be able to analyze symmetrical faults and unsymmetrical faults using symmetrical components. Students will also have understanding on Stability of single machine and multi machine stability.

UNIT-I

MODELLING CONCEPTS & PER UNIT SYSTEM : Per Unit Quantities, The circuit model of a synchronous machine, The effect of synchronous machine excitation, The ideal transformer, The equivalent circuit of a practical transformer, The auto transformer, Per unit impedances in single phase transformer circuits, 3-phase transformers, p.u. systems and its advantages: impedances of three winding transformers, One line diagram, Impedance and reactance diagrams.

UNIT-II

NETWORK CALCULATIONS: Equivalence of sources, Node equations, Matrix partitioning, Node elimination by matrix algebra, The bus admittance and impedance matrices, Modification of an existing bus impedance matrix, Direct determination of a bus impedance matrix.

UNIT-III

LOAD FLOW STUDIES- 1 : Data for Load flow studies, The Gauss-Siedel method, The Newton Raphson method (Polar & Rectangular), Digital computer studies of load flow, Information obtained in a load flow study, Numerical results.

UNIT-IV

LOAD FLOW STUDIES- 2 : Decoupled and Fast decoupled Load

flows, Control of Power into a network, The specification of bus voltages, Capacitor banks, Control by transformers.

UNIT-V

THREE PHASE SYMMETRICAL FAULTS: Transients in RL series circuits, Short circuit currents and reactance of synchronous machines, internal voltages of loaded machines under transient conditions, Bus impedance matrix in fault calculations, bus impedance matrix equivalent networks, Selection of circuit breakers.

UNIT-VI

SYMMETRICAL COMPONENTS: Synthesis of unsymmetrical phasors from their symmetrical components, Operators, The symmetrical components of unsymmetrical phasors, Phase shift of symmetrical components in star- delta transformer banks, Power in terms of symmetrical components, Unsymmetrical series impedances, Sequence impedances and sequence networks, Sequence networks of unloaded generators, Sequence impedances of circuit elements, Positive and negative and zero sequence networks.

UNIT-VII

UNSYMMETRICAL FAULTS : Single line to ground fault on an unloaded generator, Line to line fault on an unloaded generator, Double line to ground fault on an unloaded generator, Unsymmetrical faults on power systems, Single line to ground fault on a power system, Line to line fault on a power system, Double line to ground fault on a power system, Interpretation of the interconnected sequence networks, Analysis of unsymmetrical faults using bus impedance matrix, Faults through impedance, Computer calculation of fault currents.

UNIT-VIII

POWER SYSTEM STABILITY : The stability problem, Rotor dynamics and swing equation, Further considerations of swing equations, power-angle equation, Synchronizing power coefficients, Equal area criterion of stability, Further applications of the equal area criterion, Multi machine stability studies, Classical representation, Step by step solution of the swing curve, Algorithms for Digital computer programs for transient stability studies, Factors affecting transient stability.

TEXT BOOKS:

1. M. A. Pai, "Computer Techniques in Power System Analysis", Tata McGraw-Hill, 2nd edition 2005.
2. William D. Stevenson Jr, "Elements of Power System Analysis", Mc. Graw-Hill International, 4th Edition, 1982.

REFERENCES:

1. I.J.Nagrath&D.P.Kothari,"Modern Power system Analysis", Tata McGraw-Hill Publishing company, 3rd edition ,2003.
2. A.R.Bergen,"Power System Analysis", Prentice Hall Inc, 2nd edition, 2000.
3. Hadi Saadat, "Power System Analysis", TMH, 2nd edition, 1999.

POWER SYSTEM OPERATION AND CONTROL

COURSE CODE: AEE1122

L	T	P	C
4	1	0	4

AIM:

To introduce the fundamental concepts of power system operation and its control.

OBJECTIVE:

At the end of the course, the student understands:

- The economics of power system operation of simple power systems and economic scheduling of hydro-thermal mix of generation.
- Optimization of power flow including reactive power, its computation and implementation.
- Various aspects of load frequency control, interconnected operation.
- Voltage and Reactive Power Control.

UNIT-I:

ECONOMIC OPERATION OF POWER SYSTEMS:- Characteristics of Steam Plants – Input-Output curves, Incremental Heat Rate characteristics, Incremental Fuel Cost Characteristics, Heat Rate characteristics and Incremental Production cost characteristics; Generating costs at thermal plants; constraints in operation; Plant scheduling methods; Equal Incremental cost method with transmission losses neglected; Transmission Loss Formula – B-coefficients; Economic scheduling of thermal plants considering transmission losses; Penalty Factor; Evaluation of λ for computation.

UNIT-II

HYDROTHERMAL SCHEDULING: Characteristics of Hydro Plants – Incremental water rate characteristics, incremental production cost

characteristics; Hydro Electric Plant Models; Pumped Storage Plant; Hydro-thermal scheduling – Energy scheduling method; Short-term Hydro thermal scheduling – Method of Lagrange multipliers neglecting losses and considering losses.

UNIT-III

OPTIMAL LOAD FLOW : Reactive Power control for loss minimization; Gradient method for optimal load flow; Non-linear programming; Lagrange functions for optimal load flow and computational procedure; conditions for optimal load flow; Implementation of optimal load flow.

UNIT-IV

LOAD FREQUENCY CONTROL : Speed Governing Mechanism – Speed Governor, Steady-state speed regulation, adjustment of governor characteristics; Transfer function of a power system and speed governor; Governing of Hydro Units; Penstock Turbine model; Model for a steam vessel; Steam turbine model – Reheat type steam turbine model; Single Area control; The basics of Load Frequency control, analysis of single area system, dynamic response of load frequency control loop (uncontrolled case); control strategy, PID Controllers.

UNIT-V

OPTIMAL LOAD FREQUENCY CONTROL : The optimal Control Problem, Linear Regulator problem, Matrix Riccati equation; Optimal Load Frequency Control – single area system, optimal control for tandem compound single reheat Turbine-Generator system, Optimal control of Hydro Speed Governing system; Load frequency control with restrictions on the rate of power generation; Load frequency control and economic dispatch

UNIT-VI

CONTROL OF INTERCONNECTED SYSTEMS : Interconnected operation, Flat frequency control of interconnected stations, Flat Tie-line and Flat Frequency control and complete tie-line bias control; Two-Area system – Tie-Line power model, block diagram for two-area system; Analysis of Two Area system – steady-state response and dynamic response.

UNIT-VII

VOLTAGE AND REACTIVE POWER CONTROL - 1: Impedance and Reactive Power; System voltage and reactive power; reactive power generation by synchronous machines; effect of Excitation control; Voltage regulation and Power transfer; exciter and voltage regulator; Excitation systems – Block schematic of excitation control, Static Excitation system, Brushless Excitation system; Automatic Voltage Regulators for alternators; Analysis of Generator voltage control – Steady state performance evaluation, dynamic response of voltage regulation control; Stability compensation for voltage control and stabilizing transformer; IEEE – Type 1 excitation and Power System Stabilizer.

UNIT-VIII

VOLTAGE AND REACTIVE POWER CONTROL-2: Reactive power generation by Turbo-generator, Synchronous Compensators, Reactors, Capacitors, Tap-Changing Transformers; Tap-staggering method; Voltage Regulation and Short Circuit Capacity; Loading capability of a Line; Compensation in Power Systems – Load Compensation, Static Compensators and their steady state performance;

TEXT BOOK :

1. P.S.R.Murthy, "Operation and Control of Power Systems", BS Publications, Second Edition, 2011.

REFERENCES :

1. C.L.Wadhwa, "Electrical Power Systems", New-Age International Publishers, Sixth edition, 2009.
2. D.P.Kothari and I.J.Nagrath, "Modern Power System Analysis", Tata Mc-Graw Hill Publishing Company, Third Edition, 2008.
3. O.I.Elgerd, "Electric Energy Systems Theory", Tata McGraw Hill Publishing Company, second edition, 2007.
4. A.J.Wood and B.F.Wollenberg, "Power Generation, Operation and Control", John-Wiley & Sons, Second edition, 2006.
5. T.J.E.Miller, "Reactive Power Control in Electric Systems", John Wiley & Co, 1982.
6. Prabha Kundur, Power System Stability and Control" McGraw Hill Education, 2005

H.V.D.C. TRANSMISSION

Course Code: AEE1132

L	T	P	C
4	1	0	4

AIM & OBJECTIVE:

This course trains the student on types of HVDC Transmission Systems and HVDC converter analysis. The student will be able to formulate equivalent circuit of HVDC transmission system and learn the control characteristics. The student will have an understanding on various faults and protection of HVDC Transmission Systems.

UNIT-I

BASIC CONCEPTS: Comparison of AC and DC Transmission-Economics of power transmission-Technical performance-Reliability, Application of DC transmission, Description of DC transmission system-Types of DC links-Converter station, planning for HVDC transmission, Modern trends in HVDC technology.

UNIT-II

ANALYSIS OF HVDC CONVERTERS: Analysis of Graetz circuit – with grid control but no overlap-with grid control and overlap less than 60^0 -relationship between AC and DC quantities-equivalent circuit of rectifier, Inversion-equation of average direct current and voltage in terms of â and ã –equivalent circuit of inverter, 12 Pulse converters-relations between AC and DC quantities-modified equivalent circuit.

UNIT-III

HVDC SYSTEM CONTROL: Basic means of control-desired features of control-actual control characteristics-constant minimum ignition angle control-constant current control-constant extinction angle control-tap changer control-power control and current limits, System control hierarchy, firing angle control-IPC-EPC.

UNIT-IV

REACTIVE POWER CONTROL : Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies-

sources of reactive power-AC Filters – shunt capacitors synchronous condensers.

UNIT-V

CONVERTER FAULT & PROTECTION: Converter faults – protection against over current, Overvoltages in a converter station-protection against over voltage in converter station – surge arresters – smoothing reactors – DC breakers.

UNIT-VI

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

UNIT-VII

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

UNIT-VIII

MULTI TERMINAL DC SYSTEMS: Introduction, Potential applications of MTDC systems, Types of MTDC systems-series MTDC system-parallel MTDC system-comparison of series and parallel MTDC systems

TEXT BOOKS:

1. E.W.Kimbark :Direct Current Transmission, Wiley Inter Science-New York ,1971
2. K.R. Padiyar: HVDC Power Transmission System, New Age International Publishers, Second Edition, 2010.

REFERENCES:

1. J.Arrillaga, H.V.D.C Transmission, Peter Peregrinus Ltd., London UK 1983.
2. E.Uhlmann, Power Transmission by Direct Current, Springer Verlag, Berlin Helberg-1985.

RENEWABLE ENERGY SOURCES

(ELECTIVE – I)

Course Code: AEE1124

L	T	P	C
4	1	0	4

AIM:

To introduce the importance of renewable energy sources – its generation and advantages.

OBJECTIVE:

At the end of the course, the student understands:

- Issues related to conventional energy sources like depletion of fuel its environmental aspects and thus the need of renewable energy sources.
- Solar radiation – its measurement and estimation of energy to be generated, fundamentals of Photovoltaic Cells.
- Basics of Wind energy generation, bio-fuels and fuel cells.

UNIT-I

ENERGY RESOURCES:

GENERATION AND ENVIRON-MENTAL IMPACT : Electrical Energy from conventional sources – Thermal plants, Integrated Gassification Combined Cycle Power Generation, Gas Turbine Plant; Nuclear Power- Nuclear Fission and Fusion; Energy reserves of India – Coal, Oil, Natural Gas, Hydro-electric power potential;

Environmental aspects of Electric Energy Generation – Atmospheric pollution, Hydrocarbons, particulates; Thermal Pollution; Hydroelectric Projects; Nuclear Power Generation and Environment – Natural Radiation, Radioactive Pollution; Operational safety in Nuclear Power Safety; Disposal of Nuclear waste; Impact of Renewable Energy Generation of Environment.

UNIT-II

SOLAR RADIATION AND ITS MEASUREMENT: Solar constant, Spectral distribution of Extraterrestrial Radiation; Terrestrial Solar Radiation; Solar Radiation Geometry; Computation of Cosθ for any location having any orientation; Sunrise, Sunset and Day length; Empirical equation for estimating the availability of solar radiation; Solar Radiation Measurements and data for India.

UNIT-III

SOLAR THERMAL ENERGY COLLECTORS: Introduction, Flat Plate Collectors, Effect of design parameters on performance – Heat Transport System, Selective surfaces, Number of Covers, Spacing; Laws of Thermal Radiation; Transmissivity of the cover system – Transmittance considering absorption only, Transmittivity-Absorptivity product; Performance analysis of a liquid flat-plate collector; Total loss coefficient and Heat Losses; Solar Concertrating collectors – Types, Thermodynamic limits to concentration, Performance analysis of Cylindrical Parabolic Collector; Compound Parabolic Concentrator – Tracking CPC and Solar swing, Performance analysis of CPC; Solar Thermal Energy Storage.

UNIT-IV

SOLAR PHOTOVOLTAIC SYSTEM: Introduction, Semi-conductor materials and doping – p-type and n-type semiconductors, Photon energy, Fermi level, p-n junction; Photovoltaic Effect; Efficiency of Solar Cells, Limits to Cell efficiency; Semiconductor materials for Solar Cells, Application of PV systems, PV Hybrid System; Grid Interactive Solar Power System.

UNIT-V

WIND ENERGY: Introduction, Classification Wind Turbines, Types of Rotors, Terms used in Wind Energy, Aerodynamic Operation of Wind Turbines, Wind Energy Extraction, Extraction of Wind Turbine Power, Wind Characteristics, Mean Wind speed and Energy estimation, Power Density Duration Curve, Wind Power Generation Curve, Modes of Wind Power Generation, Advantages and disadvantages of Wind Energy system, Selection of Optimum Wind Energy Generator, Grid interfacing of a Wind Farm, Methods of Grid connection, Grid system and properties.

UNIT-VI

SMALL HYDROPOWER: Introduction, Power Equation, Classification of Small Hydropower Stations, Classification of Water Turbines, Specific Speed, Major components of small Hydropower Projects; Low-Head Small Hydro Power Projects.

UNIT-VII

BIOMASS ENERGY: Introduction, Biomass Resources – Biofuels, Biogas, Producer Gas; Biogas Plants, Energy Recovery from Urban Waste, Power Generation from Landfill Gas, Power Generation from Liquid Waste, Biomass cogeneration.

FUEL CELLS – Introduction, Principle of operation of an Acidic fuel cell, Fuel Cell types, Advantages of Fuel Cell power plants, Fuel Cell battery-powered Bus System.

UNIT-VIII

GEOTHERMAL ENERGY: Introduction to Geothermal energy, structure of the Earth's interior, Plate Tectonic Theory; Geothermal Resources – Hydrothermal resource, Vapour-dominated Resource, Geopressured Resource, Magma; Geothermal Power Generation.

TIDAL ENERGY : Introduction to Tidal Energy, Tidal characteristics, Tidal Energy Estimation, Energy and Power in a Double Cycle System, Development of a Tidal Power Scheme, Important components of Tidal Power Plant, Advantages and disadvantages of Tidal Power.

TEXT BOOK:

1. D.P.Kothari, K.C.Singal and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", PHI Learning Private Limited, Second Edition, 2009.

REFERENCE BOOKS:

1. G.D.Rai,"Non-conventional Energy Sources", Khanna Publications Limited,1997.
2. Tiwari and Ghosal, "Renewable Energy Sources", Narosa Publications, 2005.

RELIABILITY EVALUATION OF ENGINEERING SYSTEMS

(ELECTIVE - I)

Course Code: AEE1125

L	T	P	C
4	1	0	4

AIM :

This is a basic course on Reliability in application to Engineering Systems in general. This course, as an elective can be taken by other branches also in general, by Mechanical, Chemical and Electronics and Communication branches in particulars.

OBJECTIVE :

The subject introduces concepts of reliability after reviewing concepts of Probability and Random Variables. The course is helpful in System Analysis and Design.

UNIT-I

INTRODUCTION AND PRELIMINARIES : Introduction to the subject , Review of basic Probability Theory: Probability concepts, Venn Diagrams, Combining Probabilities, Random Variables, distribution and Density Functions, Expectation, Variance, Standard Deviation, Binomial Distribution and properties.

UNIT-II

NETWORK MODELING AND EVALUATION OF SIMPLE SYSTEMS: Network Modeling Concepts, Series, Parallel and Series Parallel Systems, Redundant Systems.

UNIT-III

NETWORK MODELING AND EVALUATION OF COMPLEX SYSTEMS: Modeling and Evaluation, conditional Probability approach, Cutset Method, Tie-set Method, Connection Matix Techniques, Event trees, Fault trees, Failure Models.

UNIT-IV

PROBABILITY DISTRIBUTION AND RELIABILITY EVALUATION: Distribution concepts, General reliability functions and evaluation, Poisson, Normal and Exponential Distribution, Reliability functions, A-posteriori failure probability, Mean Value and standard deviation, Different other distributions , Data Analysis.

UNIT-V

SYSTEM RELIABILITY EVALUATION USING PROBABILITY DISTRIBUTIONS : Series and Parallel Systems, Partially Redundant and Systems, Mean Time to Failure, Standby Systems, Wear out and Component Reliability, Maintenance and Component Reliability.

UNIT-VI

DISCRETE MARKOV CHAINS : Modeling concepts, Stochastic transitional probability Matrix, Time dependant probability evaluation, Limiting State Probability Evaluation, Absorbing States, Applications.

UNIT-VII

CONTINUOUS MARKOV CHAINS : General Modeling Concepts, State Space diagrams, Stochastic Transitional Probability Matrix.

UNIT-VIII

CONTINUOUS MARKOV CHAINS (CONTINUED): Evaluating Limiting State Probabilities and Time dependant Sate Probabilities, Reliability Evaluation in Repairable Systems, Mean time to failure, Applications.

TEXT BOOKS :

1. Roy Billington, Ronald N. Allan, "Reliability Evaluation of Engineering Systems" (Concepts and Techniques), Springer, 2nd edition, 2010.

REFERENCE BOOK :

1. Charles Ebelling, "An Introduction to Reliability & Maintainability Engineering" Tata MC. Graw Hill Science, 1st edition, 2000.

NEURAL NETWORKS AND FUZZY LOGIC

(ELECTIVE – I)

COURSE CODE: AEE1126

L	T	P	C
4	1	0	4

AIM:

To introduce fundamentals of neural networks and fuzzy logic.

OBJECTIVE:

At the end of the course, the student understands:

- Functioning and comparison of biological and artificial neuron, characteristics of artificial neural networks, its training.
- Neural Networks - Perceptron, Backpropagation, Self-Organizing maps, Associative Memory
- Application of the above networks for small applications.
- Fuzzy sets, difference between crisp and fuzzy sets, fuzzification and defuzzification.

UNIT-I

INTRODUCTION : History of Neural Networks; Structure and function of a Single Neuron – Biological neurons, Artificial neuron models; Neural Net Architectures – Fully connected networks, Layered networks, Acyclic networks, Feed-forward networks, Modular neural networks; Neural learning – Correlation learning, Competitive learning, Feedback-based weight adaptation; Applications of Artificial Neural Networks.

UNIT-II

SUPERVISED LEARNING: Single Layer Networks – Perceptrons, Linear seperability, Perceptron Training Algorithm – Termination criterion, choice of learning rate, Non-numeric inputs; Guarantee of success; Modifications – Pocket algorithm, Adalines, Multiclass algorithm.

UNIT-III

SUPERVISED LEARNING: Multilayer Networks – Multilevel Discrimination, Preliminaries – Architecture and Objectives; Back-

propagation algorithm; Setting the parameter values – Initialization of weights, Frequency of weight updates, choice of learning rate, momentum, generalizability, number of hidden layers and nodes, number of samples; Accelerating the Learning process – Quickprop algorithm, conjugate gradient; Applications.

PREDICTION NETWORKS – Recurrent networks, Feedforward networks for forecasting; Radial Basis Functions

UNIT-IV

UNSUPERVISED LEARNING : Winner-Take-All Networks - Hamming Networks, Max-net, simple competitive learning; Learning Vector Quantizers; Counter propagation Networks.

ASSOCIATIVE MODELS – Non-iterative procedure for Association; Hopfield Networks – Discrete Hopfield networks, Storage capacity of Hopfield Networks, continuous Hopfield Networks; Hetero-associators.

UNIT-V

INTRODUCTION TO FUZZY SYSTEMS : An historical perspective, the utility of Fuzzy systems, limitations of Fuzzy systems.

FUZZY SETS AND MEMBERSHIPS: Chance versus Fuzziness; Properties and Operations on classical and Fuzzy sets – Classical sets, operations on classical sets, properties of classical sets, Mapping of classical sets to Functions, Fuzzy sets, Fuzzy set operations, properties of Fuzzy sets; Classical Relations – Cartesian Product, Crisp Relations, Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition; Fuzzy Relations – Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and composition. Value Assignment – Cosine Amplitude, Max-Min Method, other forms of the composition operation

UNIT-VI

PROPERTIES OF MEMBERSHIP FUNCTIONS, FUZZIFICATION AND DEFUZZIFICATION – Features of Membership Function, various forms; Fuzzification; Defuzzification to Crisp sets, Defuzzification to scalars.

CLASSICAL LOGIC AND FUZZY LOGIC – Classical Logic, Tautologies, Contradictions, Equivalence, Exclusive or and Exclusive Nor, Logical Proofs, Deductive inference; Fuzzy Logic – Fuzzy Logic, Approximate Reasoning, other forms of the implication operation.

UNIT-VII

FUZZY SYSTEMS: Natural Language, Linguistic Hedges; Fuzzy (Rule-Based) Systems – Multiple conjunctive antecedents, multiple disjunctive antecedents, Aggregation of Fuzzy Rules.

DEVELOPMENT OF MEMBERSHIP FUNCTIONS: Membership value Assignments – Intuition, Inference, Rank Ordering, Neural Networks, Genetic Algorithms and Inductive Reasoning.

UNIT-VIII

FUZZY CONTROL SYSTEMS: Control System Design Problem, Control(Design) Surface, Assumptions in Fuzzy Control system design, simple Fuzzy Logic Controllers; Fuzzy Engineering Process Control – Classical Feedback Control, Classical PID Control, Fuzzy Control.

TEXT BOOKS :

1. Kishan Mehrotra, Chilukuri K.Mohan and Sanjya Ranka, "Elements of Artificial Neural Networks",Penram International Publishing(India),1996.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", Second Edition, John Wiley & Sons.

REFERENCE BOOKS :

1. S.N.Sivanandam, S.Sumathi and S.N.Deepa, "Introduction to Neural Networks using MATLAB ",Tata McGraw Hill Publication Private Limited,1st Edition,2005.
2. Jacek M.Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 1st Edition,1994.
3. John Yen and Reza Langari, "Fuzzy Logic: Intelligence, Control and Information", Pearson Education,1st Edition,1999.
4. George J.Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice-Hall,1st Edition,2009.

ELECTRICAL SAFETY MANAGEMENT

(ELECTIVE – I)

Course Code: AEE 1140

L	T	P	C
4	1	0	4

AIM :

To familiarize with the Electrical Safety in hazardous areas and to provide basic precautions in engineering practices.

OBJECTIVE:

To understand various electrical rules and acts, safety precautions in electrical systems

UNIT-I

INTRODUCTION TO ELECTRICAL SAFETY : Terms and definitions, objectives of safety and security measures, Hazards associated with electric current, and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety, Fire prevention and Fire Fighting.

UNIT-II

ELECTRICAL SHOCKS THEIR PREVENTION AND FIRST AID: Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark overs, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

First Aid: first principles of actions after electric shocks, Artificial respiration, External Cardiac massage, Control of bleeding, burns and scalds and Heat exhaustion

UNIT-III

ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS : Wiring and fitting –

Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT-IV

SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE: Preliminary preparations – safe sequence – risk of plant and equipment – safety documentation – field quality and safety - personal protective equipment – safety clearance notice – safety precautions – safeguards for operator's safety.

UNIT-V

ELECTRICAL SAFETY IN HAZARDOUS AREAS : Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

UNIT-VI

EQUIPMENT EARTHING AND SYSTEM NEUTRAL EARTHING: Introduction, Distinction between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, description of a earthing system, , neutral grounding(System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

UNIT-VII

SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS : Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees.

UNIT-VIII

REVIEW OF IE RULES AND ACTS AND THEIR SIGNIFICANCE : Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage – earthing

of system neutral – Rules regarding first aid and fire fighting facility.

The Electricity ACT, 2003, (Part1, 2, 3,4 & 5)

Text Books:

1. S. Rao, Prof. H.L. Saluja, "Electrical safety, fire safety Engineering and safety management", Khanna Publishers. New Delhi, 1988.
2. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997.
3. www.apeasternpower.com/downloads/elecact2003.pdf

DESIGN CONCEPTS FOR ENGINEERS

(Elective – I)

Course Code: AEE 1142

L	T	P	C
4	1	0	4

AIM & OBJECTIVE:

To teach the principles of design, and how they apply to engineering design projects and future job activities. It teaches the design process, rather than the technical details of any one engineering field. Basic design principles of and design tools, are introduced.

UNIT-I

What is engineering? Definition. Various fields of engineering. Engineering professional bodies.

UNIT-II

What is design? Difference between analysis , design, and replication. Good design versus bad design. The design cycle. Overall objectives.

UNIT-III

Modeling and analysis. Gathering information. Build document and test. Revise. Informal brain storming. Examples.

UNIT-IV

Project management and team work skills. Working in a team . Building a team. Job description. Team meetings. Working with other teams.

UNIT-V

Time line. Pert. Documentation. Logbook. Technical reports. Electronic documentation. Case studies.

UNIT-VI

Engineering tools. Estimation. Significant figures. Plots.Prototyping. Reverse engineering. Computer analysis.

UNIT-VII

The human machine interface. How people interact with machines. Ergonomics. Societies view of engineering. Learning from mistakes. Role of failure. Case studies.

UNIT-VIII

Learning to speak, write, and make presentations. Importance of good communication. Preparing for meetings. Preparing a formal presentation. Technical papers. Proposals. Instructional manuals.

TEXT BOOK:

1. Design Concepts for Engineers Mark .N Horenstien, Prentice Hall, 4th Edition, 2009.

REFERENCE BOOK:

1. Balbir S. Dillon, "Advanced Design Concepts for Engineers", Technology Publishing Company, 1st Edition, 1998.

PROGRAMMABLE LOGIC CONTROLLERS

(ELECTIVE – II)

COURSE CODE: AEE1127

L	T	P	C
4	1	0	4

AIM & OBJECTIVE :

This course trains the students on Basics of PLC including Programming and ladder logic and also students get exposure to different Registers of PLC and functions of PLC. Students will understand the applications of PLC and PID principles.

UNIT-I

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment,

programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules.

UNIT-II

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

UNIT-III

Digital logic gates, programming in the Boolean algebra system, conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system.

UNIT-IV

PLC Registers: Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.

UNIT-V

PLC Functions: Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

UNIT-VI

Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications

UNIT-VII

Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two-axis & three axis Robots with PLC, Matrix functions.

UNIT-VIII

Analog PLC operation: Analog modules & systems, Analog signal processing, Multi bit Data Processing, Analog output Application Examples, PID principles, position indicator with PID control, PID Modules, PID tuning, PID functions.

TEXT BOOKS:

1. John W. Webb & Ronald A.Reiss,, "Programmable Logic Controllers- Principles and Applications", Fifth Edition, PHI, 2009.

REFERENCE BOOK:

1. Jr. Hackworth & F. DHackworth Jr., "Programmable Logic Controllers- Programming Method and Applications"Pearson, 2003.
2. Gary Dunning, "Introduction to Programmable Logic Controllers", Delmar Thomas Learning,3rd Edition,2005.

EMBEDDED SYSTEMS

(Elective – II)

Course Code: ACT1121

L	T	P	C
4	1	0	4

AIM :

High speed systems are now part of our life. These systems are low cost intelligent systems used in all technical disciplines to add intelligence to applications. The 32 bit architecture of two popular processors is introduced.

OBJECTIVE :

This program provides ISA architecture, memory structured to System, kernel, and user modes, for generating efficient coding in Assembly and high level. It imperative that Computer students understand these developments.

UNIT-I

The ARM instruction set Architecture. The bus structure and the peripherals. Memory organization and processor initialization [startup code]. Load store instruction set. Assembly programming using assemblers. Linkers, Loaders and Debuggers.

UNIT-II

ARM / THUMB architecture. Program structure to Supervisor, Kernel, and User modes.

Peripherals and their control: GPIO, Timers, Counters, PWM, ADC and serial communication channels. Assembly example applications.

UNIT-III

Application coding Examples: Measurement and control of Time, frequency velocity acceleration, Power control, and gesture and Touch monitoring.

UNIT-IV

Modern communication protocols starting with addressable USART,

SPI bus, 12C bus and USB their characteristics protocols and usage in high speed communication.

UNIT-V

Introduction to MIPS processor architecture in PIC 32 bit family CPU architecture and a detailed introduction to peripherals present. GPIO, timers, capture control and PWM features. Instruction set usage with application examples.

(http://ww1.microchip.com/downloads/en/DeviceDoc/61146B.pdf)

UNIT-VI

Simulation and debugging of programs using MPLAB integrated development Environment. Interrupts, modes and vectored interrupt priority processing using the many shadow registers. Challenges in development of intelligent programs.

UNIT-VII

Introduction to RTOS and its need in real time applications: in industry particularly in robots, automobiles and gesture identification.

UNIT-VIII

Introduction to In circuit Emulation techniques using JTAG. Watching CPU activity, and techniques of in circuit flash programming.

TEXT BOOKS:

1. B.Kantha Rao, " Embedded Systems", 1st Edition, PHI Learning Private Limited, 2011. (Units 1, 3, 7)
2. Trevor Martin, "Introduction to the LPC2000", 1st Edition, Hitex (UK) Ltd, 2005. (Units 1, 2, 4)
3. Lucio Di Jasio, "Programming 32-bit Microcontrollers in C Exploring the PIC 32", 1st Edition, Newnes, 2008. (Units 6, 8)

REFERENCE BOOKS:

1. A.N.Sloss, D.Symes and C. Wright, "RM system's Developer Guide, Designing and Optimizing system software", 1st Edition, Morgann Kaufmann Publishers, 2004.
2. Steve Furber, "ARM system on Chip Architecture", 2nd Edition, Adison Wesley Publishers, 2000.

3. David Seal, "ARM Architecture reference Manual", 2nd Edition, Adison Wesley Publishers, 2001.

WEB REFERENCE BOOKS:

1. http://ww1.microchip.com/downloads/en/DeviceDoc/61146B.pdf (Unit 5)

DISTRIBUTION AUTOMATION

(ELECTIVE – II)

Course Code: AEE1128

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

To introduce the concepts of Distribution Automation, this is the necessity of the present Indian Power Distribution System in delivering reliable and quality power to customers.

UNIT-I

DISTRIBUTION AUTOMATION AND THE UTILITY SYSTEM: Introduction to Distribution Automation (DA), control system interfaces, control and data requirements, centralized (Vs) decentralized control, DA System (DAS), DA Hardware, DAS software.

UNIT-II

DISTRIBUTION AUTOMATION FUNCTIONS: DA capabilities, Automation system computer facilities, management processes, Information management, system reliability management, system efficiency management, voltage management, Load management.

UNIT-III

COMMUNICATION SYSTEMS FOR DA : DA communication requirements, Communication reliability, Cost effectiveness, Data rate requirements, Two way capability, Ability to communicate during outages and faults, Ease of operation and maintenance, Conforming to the architecture of data flow

UNIT-IV

COMMUNICATION SYSTEMS USED IN DA : Distribution line carrier (Power line carrier), Ripple control, Zero crossing technique, telephone, cable TV, Radio, AM broadcast, FM SCA, VHF Radio, UHF

Radio, Microwave satellite. Fiber optics, Hybrid Communication systems, Communication systems used in field tests.

UNIT-V

TECHNICAL BENEFITS : DA benefit categories, Capital deferred savings, Operation and Maintenance savings, Interruption related savings, Customer related savings, Operational savings, improved operation, Function benefits, Potential benefits for functions, function shared benefits, Guide lines for formulation of estimating equations

UNIT-VI

Parameters required, economic impact areas, Resources for determining benefits impact on distribution system, integration of benefits into economic evaluation.

UNIT-VII

ECONOMIC EVALUATION METHODS : Development and evaluation of alternate plans, Select study area, Select study period, Project load growth, Develop Alternatives, Calculate operating and maintenance costs, Evaluate alternatives.

UNIT-VIII

Economic comparison of alternate plans, Classification of expenses and capital expenditures, Comparison of revenue requirements of alternative plans, Book Life and Continuing plant analysis, Year by year revenue requirement analysis, short term analysis, end of study adjustment, Break even analysis, Sensitivity analysis computational aids.

TEXT BOOK:

1. D Bessett, E Clinard, J Grainger, S Purucker and D Ward, IEEE Tutorial Course "Distribution Automation",1988.

REFERENCE BOOK:

1. R.P.Gupta, 'ElectricPowerDistributionAutomation', Narosa Publications, 2nd Edition., 2006.
2. James A.Momoh"Electric Power Distribution, Automation, Protection and Control", CRC Press,3rd Edition, 2007.

3. James Northcote-Green,Robert Wilson"Control and Automation Of Electrical Power Distribution Systems(Power Engineering)"CRC Press,Taylor and Francis 2007.

4. Dr M.K.Khedkar,Dr G.M.Dhole,"A Text Of Electric Power Distribution Automation", Laxmi Publications,First Edition.,2004.

DATA STRUCTURES FOR ENGINEERING APPLICATIONS

(Elective -II)

Course Code: AIT1114

L	T	P	C
4	1	0	4

AIM :

To empower students to build efficient software applications with suitable data structures.

OBJECTIVE :

To make students understand the software design techniques for solving engineering applications of their discipline

UNIT-I

RECURSION AND LINEAR SEARCH : Preliminaries of algorithm, Algorithm analysis and complexity, Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi.

Chapters 1, 2 from Text Book 1

UNIT-II

SEARCHING TECHNIQUES : Introduction, Linear Search, Transpose Sequential, Search, Interpolation Search, Binary Search, Fibonacci Search.

Chapter 15 from Text Book 2.

UNIT-III

SORTING TECHNIQUES : Basic concepts, insertion sort, selection sort, bubble sort, quick sort, merge sort.

Chapter 12 from Text Book 1

UNIT-IV

STACKS : Basic Stack Operations, Representation of a Stack using

Arrays, Stack Applications: Reversing list, Factorial Calculation, In-fix-to postfix Transformation, Evaluating Arithmetic Expressions.

Chapter 3 from Text Book 1.

UNIT-V

QUEUES : Basic Queues Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack.

Chapter 4 from Text Book 1.

UNIT-VI

APPLICATIONS OF QUEUES : Applications of Queues- Enqueue, Dequeue, Circular Queues, Priority Queues.

Chapter 4 from Text Book 1.

UNIT-VII

LINKED LISTS : Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, merging two single linked lists into one list, Reversing a single linked list, Circular linked list, Double linked list. Chapter 6 from Text Book 2.

UNIT-VIII

TREES : Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays and linked lists, operations on a Binary tree , Binary Tree Traversals (recursive), Creation of binary tree from in-order and pre(post)order traversals.

Chapter 8 from Text Book 2.

TEXT BOOKS:

1. Richard F, Gilberg & Behrouz A. Forouzan, " Data Structures", 2nd Edition, Thomson, 2007.
2. GAV PAI, "Data Structures and Algorithms", 1st Edition, Tata McGraw-Hill, 2010.

REFERENCES:

1. Seymour Lipschutz, "Data Structure with C", 1st Edition, TMH, 2009.

2. Debasis ,Samanta "Classic Data Structures", 2nd Edition, PHI,2009

3. Horowitz,Sahni, Anderson "Fundamentals of Data Structure in C", 2nd Edition, Freed, University Press, 2009.

Note : A small application may be implemented in software from their respective disciplines at the end of the course.

ELECTRICAL MEASUREMENTS & SIMULATION LAB

Course code: AEE1129

L	T	P	C
0	0	3	2

AIM & OBJECTIVE:

This lab is intended to give exposure on different measuring instruments and power system using MATLAB/Mi Power.

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. Measurement of 3-phase reactive power in balanced loads.
4. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
5. Develop a simulink model for a single area load frequency problem and simulate the same.
6. Formation of Y-Bus & Z-Bus
7. Develop a program to solve Swing Equation.
8. Conduct a power flow study on a given power system network using Mi-Power.

a) Gauss- Siedel method

b) Newton – Raphson method

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 – by Phantom testing
10. Measurement of Dielectric strength of oil using H.T. testing Kit

11. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
12. Develop a simulink model for a two-area load frequency problem and simulate the same.
13. Design a PID controller for two-area power system and simulate the same.
14. Design a compensator for a given systems for required specifications.
15. Fault analysis for a given network using Mi-Power.
16. Optimal Generation scheduling of a given Power System.

MICROCONTROLLERS LAB

Subject Code: AEE 1130

L	T	P	C
0	0	3	2

AIM :

To Provide exposure to the Integrated Development Environment of various processors for writing , simulating and debugging programs in assembly language and to apply microprocessor based techniques to problems in Electrical Engineering in particular and also other disciplines of in general.

OBJECTIVE :

After successful completion of the this course a student will be familiar with using Integrated Development Environments of various processors and be able to design and write code for embedded applications.

Further the student will also be able to also test and analyze applications using the skills learnt during the course.

THE FOLLOWING EXPERIMENTS ARE REQUIRED TO BE CONDUCTED AS COMPULSORY EXPERIMENTS:

1. Evaluation of Arithmetic Expression Using 8051 Kit.
2. Binary , BCD , ASCII Conversions using MPLAB
3. Multi-precision Addition , Subtraction , Multiplication and Division using AVR Studio.
4. Program to generate square wave using 8051 microcontroller.
5. Stepper motor Control using 8051 microcontroller.
6. Keyboard & LCD interfacing using PIC processor.
7. Keyboard & LCD interfacing using Atmega processor.
8. Program to generate square wave of given duty cycle using PIC Processor.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted (using PIC/ Atmega Processors):

9. Program to generate sine wave of given frequency
10. Measurement of voltage
11. Measurement of Current
12. Servo motor – Position Control
13. Measurement of Power factor
14. Measurement of speed
15. Measurement of frequency
16. Measurement of Power
17. Measurement of Energy
18. Measurement of Torque
19. DC Motor – Speed and Direction Control
20. BLDC Motor – Speed control

COURSE STRUCTURE & SYLLABI FOR VIII SEMESTER

VIII SEMESTER:

COURSE CODE	THEORY/LAB	L	T	P	C
AEE1131	Utilization of Electrical Energy	4	1	0	4
	Elective – III	4	1	0	4
AEE1123	Power Distribution Engineering				
AEE1134	High Voltage Engineering				
AEE1143	Flexible AC Transmission Systems				
AEE1133	Smart Grid				
	Elective – IV	4	1	0	4
AEC1117	VLSI Design				
ACT1109	Data Base Management Systems				
AEE1135	Digital Control Systems				
AEE1141	Engineering Ethics				
AEE11SM	Seminar	0	0	3	2
AEE11CV	Comprehensive Viva	-	-	-	4
AEE11PW	Project Work	0	0	9	12
	Total	**12**	**3**	**12**	**30**

UTILIZATION OF ELECTRICAL ENERGY

Course Code: AEE1131

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

The objective of this course is to train students on characteristics of various drives, Heating, Welding methodologies, Illumination methods and traction system.

UNIT-I

ELECTRIC DRIVES I : Type of electric drives, choice of motor, starting and running characteristics, speed control.

UNIT-II

ELECTRIC DRIVES II: Temperature rise, Particular applications of electric drives, Types of industrial loads, continuous, Intermittent and variable loads, load Equalization.

UNIT-III

ELECTRIC HEATING: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

UNIT-IV

ELECTRIC WELDING : Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT-V

ILLUMINATION FUNDAMENTALS: Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

UNIT-VI

VARIOUS ILLUMINATION METHODS: Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of

lighting and flood lighting.

UNIT-VII

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-VIII

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. J.B. Gupta, "Utilization of Electric Power and Electric Traction", Kataria & Sons publishers, Delhi, IX Edtion, 2004., .
2. C.L. Wadhwa, "Generation, Distribution and Utilization of electrical Energy", New Age International (P) Limited Publishers, 3rd edition, 2010.

REFERENCES:

1. N.V. Suryanarayana, "Utilization of Electrical Power including Electric drives and Electric traction", New Age International (P) Limited Publishers, 1st Edition,1994.
2. E. Open Shaw Taylor, "Utilization of Electric Energy", Orient Longman,1st Edition,1937.

POWER DISTRIBUTION ENGINEERING

(ELECTIVE – III)

Course Code: AEE1123

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

To study the fundamental principles and various parts/components of power distribution systems and also impart knowledge of distribution system protection, voltage control and power factor improvement.

UNIT-I

GENERAL CONCEPTS: Introduction to distribution systems, Load modelling 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.

UNIT-II

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-III

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

UNIT-IV

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-V

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

UNIT-VI

COORDINATION : Coordination of Protective Devices: General coordination procedure.

UNIT-VII

COMPENSATION FOR POWER FACTOR IMPROVEMENT : Capacitive compensation for powerfactor 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-VIII

VOLTAGE CONTROL : Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

TEXT BOOK :

1. Turan Gonen "Electric Power Distribution system, Engineering", CRC Press, 2nd Edition, 2007.

REFERENCE BOOK:

1. A.S. Pabla "Electric Power Distribution", Tata Mc Graw-Hill Publishing company, 5th edition, 1997.
2. Anthony J Pansini, " Electrical Distribution Engineering", The Fairmont Press,INC,2007.
3. H. Lee Willis, "Power Distribution Planning Reference Book", Power Engineering Series, CRC Press, 2nd Edition, 2004.

HIGH VOLTAGE ENGINEERING

(ELECTIVE-III)

Course Code: AEE1134

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

Students gets trained in various types of Generation and Measurements of High Voltage AC, DC and Impulse waves along with testing methods of High Voltage Equipment**.** **S**tudents to become aware of the necessity of EHV AC Transmission and appreciate its power handling capacity and major problems like Corona, High Electrostatic Fields, Power Frequency voltage control.

UNIT-I

GENERATION OF HIGH VOLTAGES AND CURRENTS : Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

UNIT-II

MEASUREMENT OF HIGH VOLTAGES AND CURRENTS : Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT-III

OVER VOLTAGE PHENOMENON AND INSULATION CO-ORDINATION : Natural causes for over voltages – Lightning phenomenon, Over voltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

UNIT-IV

HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS : Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

UNIT-V

EHV AC TRANSMISSION LINE TRENDS AND PRELIMINARY ASPECTS : standard transmission voltages – power handling capacities and line losses – mechanical aspects.

UNIT-VI

CORONA : Corona in EHV lines – corona loss formulate – attenuation of traveling waves due to corona – Audio noise due to corona, its generation, characteristics and limits measurement of audio noise.

UNIT-VII

ELECTROSTATIC FIELD AND ITS CALCULATION AND EFFECTS: Electric Shock Currents and their threshold values**,** Calculation of electro static field of AC lines, Effect of High E.S. field on Humans, Animals, Plants, etc, Meters and Measurement of E.S. fields.

UNIT-VIII

POWER FREQUENCY VOLTAGE CONTROL : Problems at power frequency, generalized constants, No load voltage conditions and charging currents, voltage control using synchronous conductor, cascade connection of components : Shunt and series compensation, sub synchronous resonance in series – capacitor compensated lines

TEXT BOOK :

1. M. S. Naidu and V. Kamaraju," High Voltage Engineering", TMH Publications, 4th Edition, 2009 [UNITS 1-4].
2. Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", Wiley Eastem ltd., New Delhi – 1987 [UNITS 5- 8].

REFERENCES:

1. C. L. Wadhwa, "High Voltage Engineering", New Age Internationals (P) Limited, 3rd Edition, 2010.
2. Ravindra Arora & Wolfgang Mosch , "High Voltage Insulation Engineering", New Age International (P) Limited, 1st Edition,1995.
3. E. Kuffel, W. S. Zaengl, J. Kuffel, "High Voltage Engineering: Fundamentals", Cbs Publishers New Delhi, 2nd Edition, 2005.
4. Turan Gonen, "Electric Power Transmission System Engineering", John Wiley,1988.
5. EHV Transmission line reference book – Edision Electric Institute (GEC) 1986.

FLEXIBLE AC TRANSMISSION SYSTEMS

(ELECTIVE – III)

Course Code: AEE1143

L	T	P	C
4	1	0	4

AIM:

At the end of this course a student will be able to study the performances of various FACTS devices and also be able to distinguish which type of FACTS device can be used for a particular application and location

OBJECTIVE:

Energy plays a major role in our daily life where load is changing at every point of time so to incorporate those changes and to run the power system as flexible as possible with various contingencies. FACTS devices are one of the solutions. In this course the student will know various FACTS devices, their operations and Applications.

UNIT-I

INTRODUCTION TO FACTS : Basics of Power Transmission Networks, Control of Power Flow in AC Transmission Line Flexible AC Transmission System, Application of FACTS Controllers in Distribution Systems

UNIT-II

AC TRANSMISSION LINES AND REACTIVE POWER COMPENSATION : Introduction to FACTS controllers – Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation – Principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator and other controllers.

UNIT-III

STATIC VAR COMPENSATORS : Analysis of SVC Configuration of SVC, SVC Controller, Voltage Regulator Design (Some Issues),

Harmonics and Filtering, Protection aspects Modelling of SVC, Applications of SVC

UNIT-IV

THYRISTOR CONTROLLED SHUNT COMPENSATOR : Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor (TCR) – Thyristor Switched Capacitor(TSC)

UNIT-V

THYRISTOR CONTROLLED SERIES COMPENSATOR (TCSC) : Series compensation – Principles of operation of TCSC – Capability characteristics of TCSC – Modeling of TCSC – TCSC control system – enhancement of system damping – mitigation of sub-synchronous resonance.

UNIT-VI

STATIC SYNCHRONOUS SERIES COMPENSATOR (SSSC): Operation of SSSC and the Control of Power Flow , Modeling and Control of SSSC , SSSC with an Energy Source, Analysis of SSR with a SSSC Applications of SSSC

UNIT-VII

VSC BASED SHUNT AND SERIES COMPENSATOR : Static Synchronous Compensator (STATCOM) Principle of operation, VI Characteristics, Harmonic performance – Steady state model – SSR mitigation. Static Synchronous Series Compensator (SSSC): Principle of operation and characteristics of SSSC – control range and VA rating – capability to provide real power compensation – Immunity to sub-synchronous resonance – control scheme for SSSC.

UNIT-VIII

UNIFIED POWER FLOW CONTROLLER: Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

TEXT BOOKS:

1. Narain G. Hingorani and Laszlo Gyugyi, "Understanding FACTS concepts and technology of flexible AC transmission systems" Edition 2001, IEEE power Engineering society Sponsor, IEEE press, 2001.
2. **K.R. PADIYAR "**FACTS Controllers In Power Transmission and Distribution", New Age International (p) Limited June, 2007 **Edition**.

REFERENCE BOOKS:

1 . Vijay K. Sood, "HVDC and FACTS Controller: Application of Static Converters in power systems", IEEE Power Electronics and Power Systems series, Kluwer Academic publishers, Boston, First edition January 2004.
2. Timothy John Eastham Miller, "Reactive power control in Electric systems", John Wiley and sons, New York, 1982.
3. Yong Hua Song and Allan T Johns, "Flexible AC Transmission System (FACTS)", IEEE Power Engineering Series-IEEE press, 1999.

SMART GRID

(ELECTIVE – III)

COURSE CODE: AEE1133

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

Students get trained in information and communication technologies used Smart Grids; sensing, measurement, control and automation technologies implemented ins Smart Grids, Management Systems, Power Electronics and energy storage technologies used in Smart Grids.

UNIT-I

INTRODUCTION: Introduction, Early Smart Grid initiatives, Overview of the technologies required for the Smart Grid.

UNIT-II

COMMUNICATION TECHNOLOGIES: Introduction to data communication, Dedicated and shared communication channels, Switching techniques, Communication channels, Layered architecture and protocols, Communication technologies for the Smart Grid, Standards for information exchange

UNIT-III

INFORMATION SECURITY : Introduction to information security for the Smart Grid, Encryption and decryption, Authentication, Digital signatures, Cyber security standards.

UNIT-IV

SENSING, MEASUREMENT, CONTROL : Introduction to smart metering and demand-side integration, Smart metering, Smart meters: An overview of the hardware used, Communication infrastructure and protocols for smart metering, Demand-side integration.

UNIT-V

AUTOMATION TECHNOLOGIES : Introduction to distribution

automation equipment, Substation automation equipment, Faults in the distribution system, Voltage regulation.

UNIT-VI

DISTRIBUTION MANAGEMENT SYSTEMS : Data sources and associated external systems, Modelling and analysis tools, Applications

UNIT-VII

TRANSMISSION SYSTEM OPERATION: Data sources, Energy management systems, Wide area applications, Visualisation techniques.

UNIT-VIII

POWER ELECTRONICS AND ENERGY STORAGE : Power electronics in the Smart Grid, Renewable energy generation, Fault current limiting, FACTS, HVDC, Energy storage technologies.

TEXT BOOK :

1. Janaka E., Nick Jenkins, Kithsiri Liynage, Jianzhong Wu, Akihiko Yokoyama "The Smart Grid – Technology and Applications", John Wiley, 2012

REFERENCE BOOK

1. Clark W. Gellings, " The Smart Grid", CRC Press, 2009.
2. Lars T. Berger, Krzysztof, Iniewski, "Smart Grid Applications, Communications, and Security", John Wiley, 2012

VLSI DESIGN

(ELECTIVE – IV)

Course Code: AEC 1117

L	T	P	C
4	1	0	4

AIM:

To make the students familiarization with Concepts of VLSI Design.

OBJECTIVE:

To acquire knowledge of fabrication process involved in MOS Devices and to introduce the basic electrical properties of MOS devices and VLSI Circuit Design Processes.

UNIT-I

INTRODUCTION TO MOS TECHNOLOGIES: VLSI Design Flow, Introduction to IC Technology–MOS, PMOS, NMOS, CMOS & Bi-CMOS technologies.

UNIT-II

BASIC ELECTRICAL PROPERTIES: Basic Electrical Properties of MOS and Bi-CMOS Circuits: I_{ds} - V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, figure of merit, Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT-III

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

UNIT-IV

GATE LEVEL DESIGN : Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance

R_S and its concept to MOS, Area Capacitance Units, Calculations, Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers.

UNIT-V

SUBSYSTEM DESIGN: Sub system Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters, High Density Memory Elements.

UNITVI

SEMICONDUCTOR INTEGRATED CIRCUIT DESIGN: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach.

UNIT-VII

CMOS DESIGN METHODS AND TESTING: Design methods, Design capture tools, Design Verification Tools, CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, System-level Test Techniques, Layout Design for Improved Testability.

UNIT-VIII

INTRODUCTION TO CMOS PROCESSING TECHNOLOGY: Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and Capacitors.

TEXTBOOKS:

1. Kamran Eshraghian, Eshraghian Dougles and A.Pucknell ,"Essentials of VLSI circuits and systems ", 3rd Ed, PHI, 2005.
2. Weste and Eshraghian, "Principles of CMOS VLSI Design", Pearson Education, 3rd ed. 1999.
3. S.M. SZE, "VLSI Technology", TMH, 2nd Edition, 2003.

REFERENCES:

1. John .P. Uyemura, "Introduction to VLSI Circuits and Systems", 1st Edn., 2003. John Wiley 2. John M. Rabaey, "Digital Integrated Circuits", PHI, EEE, 2nd Edn 1997.

2. Wayne Wolf, “Modern VLSI Design”, Pearson Education, 3rd Edition, 1997.
3. Behzad Razavi,”Design of Analog CMOS Integrated Circuits”, The McGraw Hill, 2001.

DATABASE MANAGEMENT SYSTEMS

(ELECTIVE-IV)

Course Code: ACT1109

L	T	P	C
4	1	0	4

AIM:

To make the student confident in maintaining huge amount of data by creating tables, and accessing them.

OBJECTIVE:

Student can get the capability of maintenance of huge amount of data along with reducing of redundancy in data.

UNIT-I

Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor.

UNIT-II

History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

UNIT-III

Introduction to the Relational Model – Integrity Constraint over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

UNIT-IV

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT-V

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

UNIT-VI

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock – Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.

UNIT-VII

Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

UNIT-VIII

Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke : "Database Management Systems", 3rd Edition, TATA McGraw Hill, 2008.
2. Silberschatz, Korth : "Data base System Concepts",5th Edition, Mc Graw Hill, 2010.

REFERENCES:

1. Peter Rob & Carlos Coronel: "Data base Systems design, Implementation, and Management", 7th Edition, Pearson Education, 2000.
2. Elmasri Navrate: "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2007.
3. C.J.Date: " Introduction to Database Systems", 7th Edition, Pearson Education, 2002.

DIGITAL CONTROL SYSTEMS

(ELECTIVE-IV)

Course Code: AEE1135

L	T	P	C
4	1	0	4

AIM:

To provide basic tools for the design of a control system that is to be implemented using a computer or microprocessor.

OBJECTIVE:

After the completion of the course the student gains the necessary background knowledge to design a digital controller for a control system. Also the students gain an understanding of designing controllers by discretization of a continuous controller direct design and also design using State Space Methods.

UNIT-I

Sampling and reconstruction : Introduction Examples of discrete time Control Systems Digital to Analog and Analog to digital conversion, sample and hold operation (Zero order hold and First Order Hold)

UNIT-II

Introduction – Definition of Z – Transform – Z – Transform of standard functions – Theorems of z – Transform – Inverse Z – Transform.

UNIT-III

Z - Plane Analysis of Discrete Time Control Systems : Difference equations – classical solution Z – Transform method of solving difference equations.

UNIT-IV

State Space Analysis: State Space representation of Discrete Time Systems – Solving Discrete Time State Space Equations – State Transition Matrix and its properties – Methods of Computation of State Transition Matrix – Discretization of continuous times State Space Equations.

UNIT-V

Controllability and Observability : concepts of controllability and observability, Tests for controllability and observability – Duality between controllability and observability - testing for controllability and observability.

UNIT-VI

Stability Analysis: Mapping between S-Plane and Z – Plane – Primary Strips and Complimentary Strips – Constant Frequency Loci - Constant damping Ratio Loci – Stability analysis of closed loop systems in the z – plane , Jury's stability Analysis using bilinear transformation and Routh Stability criterion.

UNIT-VII

Design of Discrete Time Control Systems by Conversion Methods: Transient and Steady State response Analysis – Design based on Frequency Response Analysis – Bilinear Transformation and Design in the W – Plane – Lead, Lag, and Lag - Lead by compensation design.

UNIT-VIII

State Feedback Controllers : Design of State Feed Back Controller through Pole Placement – Necessary and sufficient conditions – Ackerman's formula.

TEXT BOOKS :

1. K. Ogata ," Discrete Time Control Systems" , Prentice Hall, 2nd edition, 2011.
2. M. Gopal ," Digital Control and State variable Methods", TMH Publication,2nd Edition,2003.

REFERENCES :

1. Kuo, "Digital Control Systems", Oxford University Press,2nd Edition.
2. Franklin, Powell, " Digital Control of Dynamic Systems" Addison Wasley.

ENGINEERING ETHICS

(ELECTIVE – IV)

Course Code: AEE 1141

L	T	P	C
4	1	0	4

AIM & OBJECTIVE:

To bring awareness of the importance of ethics within the engineering profession as the work of engineers can affect public health and safety. Also to bring awareness of what is called moral autonomy which is the ability to think critically and independently about moral issues and apply this moral thinking to situations that arise in the course of professional engineering practice.

UNIT-I

Introduction. Why ethics? Personal, professional ethics. Origin of ethical thought. Case studies.

UNIT-II

Professionalism and codes of ethics. Codes of ethics. Professional ethics.

UNIT-III

Understanding ethical problems. History of ethical thought. Ethical theories.

UNIT-IV

Ethical problem solving techniques. Analysis of issues in ethical problems. Line diagrams. Flow charts. Conflict problems.

UNIT-V

Risk, safety and accidents. Safety and risks. Accidents.

UNIT-VI

The rights and responsibilities of engineers. Professional responsibilities.

UNIT-VII

Ethics in research and experimentation. Case studies.

UNIT-VIII

Doing the right thing. Case studies.

TEXT BOOK:

1. Engineering ethics, Charles B. Fleddermann, Pearson Education, 2nd Edition, 2004.

REFERENCE BOOKS:

1. Roland Schinzinger & Mik. W. Martin " Introduction to Engineering Ethics " Mc GrawHill, Newyork – 2000.
2. Charles E. Harris, JR Michael S.Pritchard and Michel J Rabins. "Engineering Ethics, Concepts & Cases" Wadsworth Publishing Company, Belmont, CA, 2000.