MTPA – 301(A) MODELLING SIMULATION & EVOLUTIONARY TECHNIQUES

Unit-I

Model classification, Mathematical, physical and analog models, Computer simulation of continuous and discrete systems. Introduction to soft computing, Human brain and Biological Neurons, Model of an artificial neuron, Comparison between artificial and biological neural network, Characteristics of Artificial Neural Network (ANN), Basic concepts of ANN, Classification of ANN, Perceptron model and linear separability, Multilayer perceptron model, backpropagation learning, supervised, unsupervised and competitive learning, Architecture and training algorithm of Hopfield network, Radial basis function network, Kohonen self organizing feature map, counter propagation network

Unit-II

Introduction to fuzzy sets and operations, fuzzy relations, measure of fuzziness, fuzziness and probability theory, membership function and their features, fuzzification, defuzzification, fuzzy inference system (FIS), fuzzy inference methods, Mamdani and Takagi-Sugeno fuzzy methods, Fuzzy controller, Hybrid fuzzy neural systems.

Unit-III.

Evolutionary versus traditional optimization methods, Classification of optimization problems, Genetic algorithm concepts and working principle, differences between GAs and traditional methods, similarities between GAs and traditional methods, fitness function, reproduction, crossover and mutation operators in binary coded and real coded GAs, concept of schema, constraint handling in GAs.

Unit-IV

Introduction to Swarm Intelligence, Particle Swarm Optimization, Differential evolution, Ant Colony Optimization, bacterial foraging algorithm, Harmony search algorithm, and artificial bee colony optimization. Algorithm and population update mechanism of the above nature inspired evolutionary optimization techniques. Statistical analysis of results, Determination of mean and standard deviation of population, Introduction to hybrid evolutionary techniques

Unit-V

Introduction to MATLAB and Its tool boxes (like Neural network, fuzzy logic, Genetic Algorithm, Optimization toolbox), MATLAB implementation of neural networks, fuzzy logic, Genetic algorithm, Particle Swarm Optimization, Differential evolution etc. with examples

Reference Books:-

- P.D. Wasserman: Neural Computing Theory and Practice
- B. Yegnanarayana: Artificial Neural Networks
- Fu Limin: Neural Networks in Computer Intelligence
- S.N. Sivanandam, S. Sumathi and S.N. Deepa: Introduction to Neural Networks using Matlab 6.0
- S. Rajasekaran and G.A. Vijayalakshmi Pai: Neural Networks, Fuzzy Logic and Genetic Algorithms

- N.P. Padhy: Artificial Intelligence and Intelligent Systems
- S.N. Sivanandam, S. Sumathi and S.N. Deepa: Introduction to Fuzzy Logic using Matlab
- K. Deb: Optimization for Engineering Design
- K. Deb: Multiobjective Optimization using Evolutionary Algorithms
- Principles of Soft Computing by S.N Sivanandanam and S. N.Deepa

MTPA – 301(B) POWER QUALITY & CONDITIONING

UNIT 1
Understanding Power quality, types of power quality disturbances, power quality indices, Causes and effects of power quality disturbances

UNIT 2
Causes and effects of harmonics, converter configuration and their contribution to supply harmonics, other sources of harmonics

UNIT 3
Radio interference, supply standards, elimination/suppression of harmonics, classical solutions & their drawbacks, passive input filters,design of harmonic filters,Improved power quality converter topologies,(single and three phase), transformer connections, Elimination/suppression of harmonics using active power filters – topologies, and their controlmethods, PWM converter as a voltage source active filter, current source active filter,

UNIT 4
Active waveshaping of input line current, constant frequency control, constant tolerance band control, variable tolerance band control, discontinuous current control,Electromagnetic interference(EMI), EMI generation ,EMI standards,and elimination.

Reference Books:
1. Power Quality – by R.C. Duggan
2. Power system harmonics – by A.J. Arrillga
3. Power electronic converter harmonics – by Derek A. Paice
4. Power Electronics –Mohan,Undeland,Robbins

MTPA – 301(C) ADVANCE COURSE IN ELECTRICAL MACHINES

UNIT 1

Review: Primitive machine, voltage and torque equation. Concept of transformation, change of variables, m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, equation of cross field commutator machine.

UNIT 2

Induction Machine: Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1-ö induction motor & scharge motor.

UNIT 3

Synchronous Machine: Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.

UNIT 4

Operational Impedances and Time Constants of Synchronous Machines : Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactances, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.

UNIT 5

Approximate Methods for Generator & System Analysis: The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.

Reference Books:

1. Analysis of Electric Machinery - P.C.Krause
2. The General theory of Electrical Machines - B.Adkins
3. The General theory of AC Machines - B.Adkins & R.G.Harley
4. Generalised theory of Electrical m/c - P.S.Bhimbra
5. Electro Mechanical Energy Conversion - White & Woodson

w.e.f. July-2013

MTPA – 301(D) ADVANCED MEETERING TECHNOLOGY & ENERGY AUDIT

UNIT I

MEASUREMENT OF ENERGY AND MEETIRNG DATA – Principle of energy measurement classification of energy meters, induction watt-hour meters, compensation of errors, polyphase induction meters , maximum demand indicators, measurement of kVARh, measurement of kVAh, summation metering, meter testing Models of (MDAS, Technologies of meter data acquisition system (MDAS) Retrieval and storage of metering data.

UNIT II

STATIC ENERGY METERS –Registers , Comparators, electronic counters, visual read out system, LED and LCD display , Gate generators, logic circuits A/D and D/A Convertors, universal counters, Block diagram of electronic energy meter circuits. Meter Reading Instruments and Base Computer systems, prepaid energy meters

UNIT III

AUTOMATED METER READING- Types of data transfer, instant, stored and temper data, Principal and types of MODEMS, GSM/GPRS AND 3G modems, modulation techniques, modes of data transfer .

UNIT IV

DATA COMMUNICATION TECHNOLOGY OF METERS- RF, LPR, Optical, Infrared, Data Concentrators, Meter Networks Topology.

UNIT V

METERING PROTOCOLS-Proprietary and open protocol MIOS, STANDARIZATION of metering protocols, COSEM and DLMS, Indian standard for DLMS meter protocol, Protocol Testing, Data security in meters

UNIT VI

Energy Audit In Power System: Electricity billing,. electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Energy audit in Electrical Systems

Reference:

1. Energy Auditing Made Simple by P Balsubramaniam
2. Energy Efficiency in Electrical Utilities bu BEF.
3. Energy Management by W K Murphy & G Mckay.

MTPA – 302(A) EHVAC/DC Transmission

Unit-I

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control,
Overlapping.

Unit-II

FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

Unit-III

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.

Unit-IV

Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

Unit-V

Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages

Reference:

1. S. Rao,- “EHV AC & DC Transmission” Khanna pub.
2. Kimbark,-” HVDC Transmission” john willy & sons pub.
3. Arrillaga,- “HVDC Transmission”2nd Edition ,IEE londan pub.
4. Padiyar, -“HVDC Transmission” 1st Edition ,New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -“Power System Analysis”, Oxford University
6. Narain.G. Hingorani, l. Gyugyi-”Undustanding of FACTS concept and technology”, John Wiley & sons pub.
7. P.Kundur- “H.V.D.C. Transmission” McGraw Hill Pub.

MTPA – 302(B) Digital Signal processing & its Application

UNIT 1

Introduction to DSP - Classification of signals, Multichannel and multi dimensional continuous v/s discrete time signals, continuous v/s discrete valued signals, continuous time sinusoidal signal, discrete time sinusoidal signals, sampling of analog signal, sampling theorem, quantification and coding of D/A conversion.

UNIT 2

Discrete Time Signal and Systems - Discrete time signal, systems, Z-transform & Inverse Z-transform, analysis of discrete time, linear time invariant systems, co-relation of discrete time systems.

UNIT 3

Frequency Analysis Of Signals - Frequency analysis of analog signals, frequency analysis of discrete time signals. Properties of Fourier Transform, Frequency Domain Characteristics, Time Frequency Dualities, Sampling of signals in time and frequency domain, DFT & FFT.

UNIT 4

Design Of Digital Filter - Design of linear phase FIR filter using window & frequency sampling method. Design of equiripple linear phase filters. Comparision of design methods for linear phase FIR filters. Design of IIR filters from analog filters. Direct Design Technique for digital IIR filters.

UNIT 5

DSP Application - Introduction to digital signal processors chips, case study of different DSP applications. Application of filters to analog & digital signal processor, FET spectrum analyzer.

Reference Books :

1. Digital Signal Processing - W.D.Stanley
2. Analog & Digital Signal Processing – Ashok Ambardar

MTPA – 302(C) Smart Grid Operation

Introduction to Smart Grid & its key features, Objective and scope of smart grid, drivers for smart grid, smart grid functions, challenges for smart grid implementation, technologies for smart grid, goals for future smart grid, Smart grid initiatives in india.
Deployment metrics and measurements: smart grid metrics, smart grid characteristics. Enables informed participation by customers, functions of smart grid, managing supply and demand, Distributed generation and storage, smart grid solutions to power quality issues, optimizing asset utilization & operating efficiency, progress towards realizing the characteristics of the modern grid, challenges to smart grid deployments
Understanding Smart Grid Benefits, How does the Smart Grid Generate Benefits, Benefits of Improved Reliability, Benefits of Improved Efficiency, Benefits of Improved Economics, Benefits of Environmental Improvements, Improvements in Security and Safety, Societal Benefits.

References:

1. “Smart grid design for efficient and flexible power networks operation and control” , James A. Momoh.

2. “Security & privacy challenges in the smart grid”, secure systems, Patrick Mc-Daniel and Sean W smith. Co-published by IEEE computer and reliability societies.

3. “Design & implementation of AMR Smart Grid System”, Asif mehmood, Muhammad Amir, and Muhammad Irfan Anis, 2008, IEEE Electrical Power & Energy Conference.

4. “Multi agent systems in a distributed smart grid: design & implementation”, M. Pipattanasomporn, H. Feroze, and S. Rahman, IEEE.

MTPA – 302(D) Energy Conservation Management & Audit

UNIT I

Energy Scenario: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change, Energy Conservation Act-2001 and its features.

UNIT II

Electrical Billing, Power Factor & Capacitors, Load Management, Energy Conservation in Motors & Transformers (Types, Characteristics), Pumps, Compressors, Blowers, Fan Cooling Towers.

UNIT III

Energy Conservation Opportunities in Compressed Air Distribution System, Lighting System, Energy Conservation through: Variable Speed Drives.

UNIT IV

Energy Audit, Need, Types of Energy Audit, Energy Management Audit Approach,- Understanding Energy Costs, Matching Energy Use to Requirement, Maximizing System Efficiencies, Optimizing the Input Energy Requirements, Energy Audit Instruments. Investment Need, Appraisal and Criteria

UNIT V

Financial Analysis Techniques-Simple Payback Period, Return on Investment, Net Present Value, Internal Rate of Return, Cash Flows, Risk and Sensitivity Analysis; Financing Options, Energy Performance Contracts and Role of ESCOs.

References:

1. Energy Conservation in Process Industry, Kenny W.F.
2. Energy Conservation & Utilization, Krenz H. Jerrold
3. Waste Energy Utilization Technology, Kiang, Yen Hsiung
4. Waste less Chemical Processing, Kafarov, V.V.
5. Electrical Energy Utilization & Conservation, Tripathy, S.C.
6 Efficient Electrical use by C.B. Smith
7 Savings Electricity in Utility Systems of Industrial Plants by B. G. Desai, B.S. Vaidya D.P. Patel &R. Psarman
8 Efficient Use of electricity in industries by B.G. Desai, B.S. Vaidya, M.P. Parmarad R. Parman
9 Pump application desk Book by P.N. Garagy
10 Electrical Power Distribution in Industrial plants by M.D. Parmar
11 Electronic Energy Utilization and Conservation by S.C. Tripaths
12 Industrial Energy Management & Utilization, Hemisphere Publishing Corporation, Washington, G.L. Witte, Philips S. Scbmidt and Daid R. Brown.
13 Principles of Management , Vol I, II,& III by S. Tarachand.

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