KURUKSHETRA UNIVERSITY, KURUKSHETRA
M.TECH. (ELECTRICAL ENGINEERING)

L	T	Ext.	Int.	Cr.
3	1	60	40	4

SPECIAL TOPICS IN POWER SYSTEMS
MTEE-215

Unit-1

Power System Restructuring and Deregulations: Introduction to Power System Deregulation Market Models Pool & Bilateral International Experiences. Role of ISO, Market Power, Bidding and Auction Mechanisms.

Transmission Open Access, Transmission Pricing, Impact of Congestion and Congestion Management, ATC and Factor affecting ATC, Determination of ATC.

Unit-2

Power System Computation and Computer Application: OPF and its Formulation, Solution Techniques NLP Methods, LPOPF Interior Point Method, AI Techniques, GA and Particle Swarm Optimization (PSO).

Unit-3

SCADA & Distribution Automation: Energy management systems, Power system communication, PICC Digital Communication, Microwave communication, Utility communication architecture, Java and Web based technologies. Software Agents.

Unit-4

Flexible AC Transmission Systems (FACTS): Reactive Power Control in Electric Transmission Systems, Loading Capability and Stability Considerations. Introduction to FACTS, related concepts and system requirements, Application considerations of FACT devices.

Text/Reference:

1. Lei Lee Lai, Power System restructuring and deregulation. John Wiley and Sons, UK. 2001.
2. K. Bhattacharya, MHT Bollen and J.C Doolder, Operation of Restructured Power Systems, Kluwer Academic Publishers, USA, 2001.
3. A.J Wood and B.F Wollenberg. Power System Operation and Control, John Wiley and Sons.
4. S.A Soman, S.A Khafasok, Shubha Pandit, Computational Methods for large Sparse Power System Analysis: An Object Oriented Approach. Kluwer Academic Publishers.

Note: The theory question paper will have 5 sections containing a total of 9 questions. Section-1 will have one compulsory question from whole syllabus. The remaining 8 questions will be divided into 4 sections (2 questions per unit per section) and the student will have to attempt 5 questions i.e. exactly one question from each of the sections.

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INTELLIGENT CONTROL
MTEE -205

Unit-1

ANN Models & Architecture:

Biological foundations, ANN models, Types of activation function, introduction to network architecture, multilayer feed forward network (MLFFN), Kohonen self organizing map,radial basis, Function network (RBFN), recurring neural network.

Unit-2

Learning Processes:

Supervised and unsupervised learning, error-correction learning, Hebbian learning, Boltzmanlearning, single layer and multilayer perception model, least mean square algorithm, back propagation algorithm, Application in forecasting and pattern recognition and other power engineering problems.

Unit-3

Fuzzy Sets and Theory:

Fuzzy sets, fuzzy set operations, properties, membership functions, fuzzy to crisp conversion,measures of fuzziness, fuzzification and defuzzification methods, application in engineering problems.

Unit-4

Fuzzy Control System:

Introduction, simple fuzzy logic controllers with examples, special forms of fuzzy logic models,classical fuzzy control problems.

Text/References:

1. M. T. Hagon, Howard B. Demuth and Mark Beale, “Neural Network Design, PWSPublishing Company” 1995.
2. Jacek M Zurada, “Introduction to Artificial Neural Systems”, Jaico Publishing House,Bombay, 1994.
3. Wasserman, “Neural Computing: Theory and Practice, Van Nastrand Reinhold, 1989”
4. Freeman, J. A. and D. M. “Neural Networks _-Algorithms, application and programmingtechniques, Addison Weley, 1991”
5. Ronald R. Yager and Dimiyar P. Filev, Essentials of Fuzzy Modeling and Control, John Wiley & Sons, Inc
6. Rajasekran S. and Pai G. A.V” Neural Networks, Fuzzy logic and genetic Algorithm Sysnthesis and Applications, PHI New Delhi.

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POWER SYSTEM RESTRUCTURING AND DEREGULATION
MTEE-217

Unit-1

Introduction: Basic concept and definitions, privatization, restructuring, transmission open access, wheeling, deregulation, components of deregulated system, advantages of competitive system.
Power System Restructuring: An overview of the restructured power system, Difference between integrated power system and restructured power system, Explanation with suitable practical examples.

Unit-2

Deregulation of Power Sector: Separation of ownership and operation, Deregulated models, pool model, pool and bilateral trades model, multilateral trade model.
Competitive electricity market: Independent System Operator activities in pool market, Wholesale electricity market characteristics, central auction, single auction power pool, double auction power pool, market clearing and pricing, Market Power and its Mitigation Techniques, Bilateral trading, Ancillary services.

Unit-3

Transmission Pricing: Marginal pricing of Electricity, nodal pricing, zonal pricing, embedded cost, Postage stamp method, Contract Path method, Boundary flow method, MW-mile method, MVA-mile method, Comparison of different methods.

Unit-4

Congestion Management: Congestion management in normal operation, explanation with suitable example, total transfer capability (TTC), Available transfer capability (ATC), Different Experiences in deregulation: England and Wales, Norway, China, California, New Zealand and Indian power system.

Text/Reference:

1. Loi Lei Lai,"Power System Restructuring and Deregulation", John Wiley & Sons Ltd.
2. K. Bhattacharya, MHT Bollen and J.C Doolder, Operation of Restructured Power Systems, Kluwer Academic Publishers, USA, 2001.
3. Lorrin Philipson and H. Lee Willis,"Understanding Electric Utilities and Deregulation", Marcel Dekker Inc, New York.
4. Yong-Hua Song, Xi-Fan Wang, Operation of market-oriented power systems, Springer, Germany.

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POWER SYSTEM PLANNING
MTEE-207

Unit-1

Introduction: Power System planning, objective, stages in planning & design, Key indices of power system reliability and their calculations, Linkage between reliability and capacity planning.

Unit-2

Generating System capability Planning: Probabilistic models of generating units, growth rate, Rate of generation capacity, Outage performance and system evaluation of loss of load and loss of energy indices, Power supply availability assessment

Unit-3

Interconnected Systems: Multi area reliability analysis, Power pool operation and power exchange energy contracts, quantification of economic and reliability benefits of pool operation
Demand/ Energy forecasting: Electricity consumption pattern, Peak demand and energy forecasting by trend and economic projection methods,

Unit-4

Power System expansion planning: Formulation of least cost optimization problem involving capital, operation and maintenance costs of candidate units of different types.
Investment Planning Models: Traditional generation expansion planning models, integrated resource planning models, production cost simulation models.

Text/Reference:

1. Wallach Y., Power System Planning, McGraw Hill International.
2. Sullivan P., Power System Planning, McGraw Hill International.
3. Dasari, S. " Electric Power System Planning, " IBT Publishers, New Delhi.
4. Billinton R., Power System Reliability Calculation, MIT Press, USA
5. Endreyni, Reliability Modeling in Electric Power System, John Wiley, New York
6. McDonald J.R., Modern Power system Planning, McGraw Hill International.

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LOAD AND ENERGY MANAGEMENT
MTEE-213

Unit-1

Load Forecasting: Classification and characterization of loads, Approaches to load forecasting, Forecasting methodology, Energy forecasting, Peak demand forecasting, Non-weather sensitive forecast and Weather sensitive forecast, Total forecast, Annual and monthly peak demand forecasts. Applications of state estimation to load forecasting.

Unit-2

Load Management: Introduction to Load management. Electric energy production and delivery system structure (EEPDS). Design alternatives for EEPD systems. Communication/control techniques for load management. Tariff structure and load management, principles of macro & microeconomics and energy pricing strategies, Assessing the impacts of load management.

Unit-3

Energy Demand Forecasting: Static and dynamic analysis of energy demand, elements of energy demand forecasting, methodologies and models for energy demand forecasting, techno-economic approach in energy demand forecasting.

Unit-4

Trends and Case Studies: Energy management strategy, symbiotic relation between information, energy models and decision making, case studies like industrial energy forecasting, transportation energy forecasting, residential, commercial and agricultural energy forecasting

Text/Reference:

1. Martino J., Technological Forecasting for Decision Making, Elsevier Press, New York.
2. Gellings C.W. and Penn Well P.E., Demand Forecasting in the Electric Utility Industry, Fairmount Press
3. Makridakis S., Forecasting Methods and Applications, Wiley.
4. Barney L. Capehart, Wayne C. Turner, William J. Kennedy, Guide to energy management, The Fairmont Press, Inc.
5. Pradeep Chaturvedi, Energy management: challenges for the next millennium, Concept Publishing Company, New Delhi.

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RELIABILITY ENGINEERING
MTEE-211

Unit-1

Review of basic concepts in Reliability Engg., Reliability function, different reliability models, etc., Reliability evaluation techniques for complex systems; Tie set and cutest approaches, different reliability measures, Reliability allocation/apportionment, reliability improvement, redundancy optimization techniques.

Unit-2

Fault tree analysis: fault tree construction, simplification and evaluation, importance measures, modularization, applications, advantages and disadvantages of fault tree techniques.

Unit-3

Maintainability Analysis: measures of system performance, types of maintenance, reliability centered maintenance , reliability and availability, evaluation of engineering systems using Markov models.

Unit-4

Applications of fuzzy theory and neural networks to Reliability Engineering. Reliability testing, design for reliability and maintainability.Typical reliability case studies.

References:

1. R. Ramakumar, “Engineering Reliability”, Prentice Hall, NJ.
2. KB Mishra, “Reliability Analysis & Prediction”.
3. KB Mishra, “New trends in System Reliability Evaluation”.
4. M.L. Shooman, “Probabilistic reliability – an engineering approach” RE Krieger Pub., 1990.
5. K.K. Aggarwal, “Reliability Engineering”.
6. Roy & Billington-“Reliability Engineering”.

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ADVANCED MICROPROCESSORS
MTEE -209

UNIT-1

Architecture of 8086 microprocessor, Memory Addressing, Bus Timings for MN/MX mode, interrupt structure. Memory Interfacing and Address decoding techniques for 8086 microprocessor

UNIT-2

Addressing modes, Instruction set and application programs, Assembler Directives, Programming Techniques using TASM, Interfacing D/A and A/D converters using programmable I/O devices, Interfacing Stepper motor. ARCHITECTURE OF INTEL X86 FAMILY :CPU block diagrams, Pin diagrams and internal descriptions of -80286,386,486 and Pentium Processor, Instruction formats.

UNIT-3

Introduction to microcontrollers, Architecture of 8051 microcontroller, basic Instruction set, programming, serial data communication, interfacing with D/A and A/D converters.

UNIT-4

Application of Microprocessors, A Microcomputer-based Industrial Process-control System, Hardware for Control Systems and Temperature Controller, Overview of Smart-Scale Operation.

References:

1. Advanced Microprocessors, PHI, D.V.Hall
2. The Intel Processors, Pearson Education, B. Brey
3. Gibson, “Microprocessors”, Prentice Hall of India.
4. K.J. Ayala, “Micro Controller”, Penram International

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COMPUTATIONAL METHODS FOR ELECTROMAGNETICS
MTEE -219

Unit-1

Fundamental Concepts:
Review of Maxwell's equations & boundary, conditions, integral equations versus differential equations, radiation and edge, conditions, modal representation of fields in bounded and unbounded media.

Unit-2

Green's Functions:
Green's function technique for the solution of partial differential equations, classification of Green's functions, various methods for the determination of Green's functions including Fourier transform technique
and Ohm-Rayleigh technique, dyadic Green's functions, determination of Green's functions for free space, transmission lines, waveguides, and microstrips.

Unit-3

Integral Equations:
Formulation of typical problems in terms of integral equations: wire antennas, scattering, apertures in conducting screens and waveguides, discontinuities in waveguides and microstriplines; Solution of Integral equations: General Method of Moments (MoM) for the solution of integro-differential equations, choice of expansion and weighting functions, application of MoM to typical electromagnetic problems.

Unit-4

Finite Element Method:
Typical finite elements, Solution of two-dimensional Laplace and Poisson's equations, solution of scalar Helmholtz equation.

Finite-difference Time-domain Method:
Finite differences, finite difference representation of Maxwell's equations and wave equation, numerical dispersion, Yee's finite difference algorithm, stability conditions, programming aspects, absorbing boundary conditions.

Suggested Books:

1. Collin, R.E., "Field Theory of Guided Waves", 2 Ed., Wiley-IEEE 1991 Press.
2. Peterson,A.F,Ray, "Computational Methods for 1998 Electromagnetics", Wiley- IEEE Press.
3. Harrington, R.F., "Field Computation by Moment Methods", Wiley-1993 IEEE Press.
4. Sadiku, M.N.O., "Numerical Techniques in Electromagnetics", 2 Ed.,2001 CRC Press.
5. Stutzman, W.L. and Thiele, H.A., "Antenna Theory and Design", John Wiley & Sons.
6. Volakis, J.L., Chatterjee, A. "Finite Method for 1998 Electromagnetics", Wiley-IEEE Press.
7. Taflov, A. and Hagness, S.C., "Computational Electrodynamics", 3 2005 , Artech House.
8. Field & Waves Electromagnetics, Cheng D.K.Pearson Education.

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